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Daniel Sharpe.

Plume

Pl. To face the Title.

A. Motte ſculp.

He ſpake of trees, from the cedar-tree that is in Lebanon, even unto the hyſſop that ſpringeth out of the wall; he ſpake alſo of beaſts, and of fowl, and of creeping things, and of fiſhes. 1 Kings 4.33.

86980.

Spectacle de la Nature:

OR

Nature diſplay'd.

BEING

DISCOURSES

On ſuch Particulars of

NATURAL HISTORY

As were thought moſt proper

TO EXCITE the CURIOSITY,

AND

FORM the MINDS of YOUTH.

Illuſtrated with COPPER PLATES.

Tranſlated from the Original *French*,
By Mr. *HUMPHREYS.*

The FOURTH EDITION, Corrected.

LONDON,
Printed for J. and J. PEMBERTON in *Fleet-ſtreet*;
R. FRANCKLIN, in *Covent-Garden*; and
C. DAVIS, in *Pater-noſter-row*.
M.DCC.XXXIX.

WELLCOME
HISTORICAL
MEDICAL
LIBRARY

TO HIS

ROYAL HIGHNESS

THE

Duke of *Cumberland.*

SIR,

THE univerſal Approbation which the ſeveral *French* Editions of this Volume have received, from Perſons of the fineſt Taſte, furniſhed me with an Inducement to lay the following Tranſlation at Your Royal Highneſſes Feet.

The amiable Qualities, with which Nature has enriched Your Royal Highneſs, have been ſo happily cultivated by the beſt of Educations, that I am perſuaded the wonderful Scenes of Providence, ſo elegantly diſplayed in this Treatiſe, will not be conſidered by Your Royal Highneſs, as an unpleaſing Entertainment, unleſs I have been ſo unfortunate as to render it ſuch, by a diſagreeable Verſion.

As the Mind of Your Royal Highneſs has been watered with the pureſt Streams that Learning could diſpenſe, and as you have long been habituated to thoſe Inſtitutions which render a young Prince the Darling of thoſe who have the Honour to approach him, there is ſufficient Reaſon to believe, that any generous Attempt to promote uſeful Knowledge, and inſpire the Sons of Men with Gratitude to their great Creator, will obtain a favourable Reception from Your Royal Highneſs, whoſe Cabinet has ever been inacceſſible to the low Singularities of Infidels and Sceptics.

The Worthy Author of the following Converſation, has charmed ſo many of the politeſt Readers, with his engaging *Diſplay of Nature*, that I was ambitious of employing my ſmall Abilities, in transfuſing his Sentiments into the *Engliſh* Language; and ſhould Your Royal Highneſs condeſcend to think I have not been altogether unſucceſsful in my Attempt, I ſhall then have the Honour of being indebted to you, for a Pleaſure that will always be gratefully predominant in the Heart of,

SIR,

Your Royal Highneſſes's

Moſt Obedient

And Moſt Devoted,

Humble Servant,

Samuel Humphreys.

THE

PREFACE.

OF all the Methods capable of being practiſed with Succeſs, for cultivating the Underſtanding of young Perſons, and giving them an early Habit of Thinking; there are none that produces more ſure and laſting Effects than Curioſity. The Deſire of Knowledge, is as natural to us as Reaſon, it exerts itſelf with Force and Vivacity through every Stage of Life; but never with more Efficacy than in Youth, when the Mind, being unfurniſhed with Knowledge, ſeizes, with a peculiar Eagerneſs, on every Object preſented to it, reſigns itſelf to the Charms of Novelty, and eaſily contracts the Habit of Reflection and Attentiveneſs.

We might receive all the Benefit this happy Diſpoſition is able to produce, did we employ it upon Objects equally qualified to engage the Mind by Pleaſure, and fill it with clear and inſtructive Ideas. This double Advantage is to be attained, in full Perfection, by the Study of Nature; whether we conſider her Structure, and Aſſemblage in general, or take a Survey of her Beauties in particular. Through all her Works ſhe *is qualified to pleaſe and inſtruct, becauſe they are all full of Harmony and Contrivance. All the Bodies that ſurround us, the leaſt as well as the largeſt, acquaint us with ſome Truth; they have all a Language, in which they addreſs themſelves to us, and indeed to us alone. We learn ſomething from their particular Conſtitution, and their Determination to a certain End, points out the Intention of the Creator. The Relations they bear to one another, as well as to us, are ſo many diſtinct Voices that call for our Attention; and which, by the Counſels they give us, replenish our Lives with Accommodations, enrich our Minds with Truth, and warm our Hearts with Gratitude. In a Word, we may ſay, that Nature is the moſt learned and compleat of all Books, proper to cultivate our Reaſon, ſince ſhe comprehends at once, the Objects of every Science, and never confines her Inſtructions to any particular Language, or People.*

It is from this Book, lying open to every Eye, tho' very little conſulted, that we propoſe to give an Extract, with the View of making young Perſons ſenſible what Treaſures they poſſeſs unenjoyed, and to preſent to their Obſervation thoſe things, that Diſtance, Minuteneſs, or Inattention may have concealed from them. Inſtead of paſſing methodically, from general Maxims, and univerſal Ideas, to thoſe that are more particular, we thought it incumbent on us to imitate the Order of Nature herſelf, and begin with the firſt Objects we perceive around us, and which are every Moment at Hand; we mean Plants, and Animals.

nimals. We have begun with Animals of the ſmalleſt Bulk. From Inſects, and diminutive Creatures, cloathed with Shells, we proceed to Birds, terreſtrial Animals, and Fiſhes. After an Examination of Part of the Services they yield us, we paſs to thoſe we receive from Plants, with an Attempt thro' the whole, to mix Improvement with Variety. If we have not always confined ourſelves to a ſcrupulous Regularity, it was becauſe we think it allowable, in conducting the Mind to Truth, to expatiate out of the ſtraiteſt Way, when we find it too rugged; and to ſtrike into the moſt agreeable and amuſing Track, if it equally leads us to the Place we wou'd arrive at.

But as it is not ſufficient to give the Mind a Propenſity to be inquiſitive, by entertaining it with agreeable Scenes, unleſs, we likewiſe teach it to be moderate and cautious in its Curioſity; we have concluded this firſt Part with a ſhort Conſideration of the juſt Prerogatives, and neceſſary Limits of human Reaſon, its great Intereſt conſiſting in the Enjoyment of whatever is accommodated to it, without vainly purſuing what is not privileged to approach.

We have comprehended all theſe different Points, not under the Title of, The Natural Philoſophy of Children; *which wou'd have been very proper, had we only propoſed to improve the moſt tender Age; nor under that of,* General Phyſics; *which promiſes too much: Our Deſign not being to offer any Syſtem in favour of thoſe who have made much greater Advances: But we have* *ranged them under the Title of,* NATURE DISPLAY'D; *which only implies the Exterior, or what ſtrikes the Senſe, and expreſſes, with a ſufficient Exactneſs, all of this Claſs that is granted to Mankind in general, is intelligible to every Age, and which no one can avoid being acquainted with to a certain Degree. We all enjoy Sight, and are converſant with the external Part of Nature. This View of it is for us, and in confining ourſelves to it, we, in every Part, ſufficiently diſcover Beauty, Inſtruction, and Truth. We are certain of the Exiſtence of Objects; we ſee their Form, we experience their Goodneſs, we calculate their Number, we behold their Properties and Relations, their Tendencies and Uſe. Here is an ample Variety of inſtructive Exerciſe for the Mind. Every new Information is an additional Pleaſure. We ſee our Riches increaſing with our Diſcoveries, and the View of ſo many Benefactions muſt needs baniſh Ingratitude and Indifference from our Hearts. But if we deſire to fathom the very Depths of Nature, to trace Effects up to their particular Cauſes, and comprehend the Curioſity and elaſtic Play of every ſecret Spring, as well as the minuteſt Element that compoſe them, this is an arduous Attempt, the Succeſs of which is very uncertain, and we leave it to thoſe tranſcendent Geniuſes who are permitted to behold and enter into thoſe Myſteries. For our Part, we think it better becomes us to content ourſelves with the exterior Decoration of the World, and the Effect of thoſe Machines which conſtitute the Proſpect. Here we have*

Acceſs, and may even ſee, that it was arrayed with ſo much Splendor, in order to excite our Curioſity. But then, ſatisfied with a Survey that abundantly fills our Senſes and Imagination, it is not neceſſary we ſhould require the ſecret Pavilion of theſe Machines to be unfolded to our View. In a Word, 'tis our Province to ſelect, out of the Scene of Nature, all that can give us lively Impreſſions, and exerciſe our Reaſon to Advantage, without ever touching upon thoſe Points which ſeem above the Reach of that Faculty, or even upon thoſe that would eaſily weary its Efforts.

As to the Model of the Work, we have endeavoured to exclude from it whatever might ſeem diſagreeable; and inſtead of methodical Diſcourſes, or a Chain of Diſſertations, that frequently ſatiate and diſguſt; we have choſen the Style of Dialogue, as moſt natural, and proper to engage all Sorts of Readers.

Our firſt Thought, in the Choice of Interlocutors, was to have introduced ſome celebrated Characters. It gives one a ſenſible Pleaſure to ſee great Men revive in Dialogue, and by an agreeable Alluſion, we imagine ourſelves Sharers in their Converſation, and are intereſted in what we believe we hear. But it is eaſy to obſerve, how inconſiſtent ſuch a Choice would have been with the Deſign we propoſe to purſue. Had we intended to eſtabliſh Maxims for the Regulation of Behaviour, or to criticiſe the Imperfections of Mankind, we might, with Succeſs, have borrowed from Hiſtory, a Set of Names well known, and *proper to render the Diſcourſe more important. Theſe Perſonages would be as entertaining in Dialogue, as they are in the theatrical Repreſentations, in proportion to the Conformity of their Characters and Sentiments to the Account we find of them in Hiſtory. But the Caſe is not the ſame, in Points of Inveſtigation and Philoſophy.*

'Tis a very dangerous Attempt, to give Language to Des Cartes, Malbranche, *or* Newton, *and to lend theſe great Men their Ideas and Views. 'Tis eaſy to declare, that we are preparing to introduce* Gaſſendi *and* Rohault; *or, in other Words, that we are attempting to revive their Knowledge, Sentiments, and Characters. But how can one be punctual to ſuch a Promiſe? To think, and ſpeak like them, we muſt be what they themſelves were. Beſides, they are Perſons who are not eaſily accommodated to the Level of all Sorts of Readers. Their Conferences muſt be ſublime, and have the Air of perpetual Diſſertations, in order to preſerve their due Similitude. We ſhou'd likewiſe gain no extraordinary Point, if we brought together ſome of our moſt celebrated Obſervers; and, I am afraid, that* Aldrovandus *and* Goëdaert, Malpighi *and* Grew, Leeuwenhoek, *and* Swammerdam, *wou'd not be proper Perſons to preſent to the Reader. As valuable as theſe Authors may be, their Names alone would not conſtitute the Succeſs of a Dialogue; whereas thoſe Characters which are leſs conſpicuous, will always make themſelves known and reliſhed, if what they advance be profitable and correſpondent to Nature.*

After all, as our Intention is only to entertain the Minds of young People with a free Converſation, ſuited to their Abilities, without perplexing them with Characters too ſtrongly marked, or indulging a Vein of Pleaſantry that would have too much the Air of a Theatre, we judged it proper, without much Parade, and as it likewiſe appeared moſt natural, to chuſe the Country for a Scene of Dialogue *on* the Hiſtory of Nature; *and, in order to introduce or vary the Subject, it ſeemed neceſſary to fix on Perſonages of different Conditions, ſome of whom might furniſh out Converſation from their Knowledge and Experience, and others render it engaging by their Curioſity.*

Beſide this, there is a greater Advantage than at firſt may be imagined, in throwing the Sciences into the Diſcourſe of polite People who are converſant with the World, ſuch as Chance every Day aſſembles, and ſuch as Friendſhip, or a Similitude of Taſte ſelects. And tho' theſe Characters give us, at firſt, leſs favourable Preventions than we receive from illuſtrious Names, yet, in the Event, we accommodate ourſelves to them the better, becauſe our Faculties need not make any extraordinary Efforts to underſtand and follow them. Whatever they ſay, that appears curious and new, affects us with ſtronger Impreſſions. We find ourſelves touched with an agreeable Pride, to hear ſuch Things from our Equals: and, whilſt we give them our Attention, fancy we are capable of thinking and amuſing ourſelves as rationally as they; and the ſecret Approbation we afford them, inſenſibly *becomes a natural Allurement to imitate them. Theſe are the Conſiderations that have regulated our Choice.*

A Youth of Quality, whom we ſhall call the Chevalier du BREUIL, *in the Vacation from his College Studies, and at a Time when his Father had taken a Journey, to make an advantageous Proviſion for his eldeſt Son, pays a Viſit, in the Country, to a Gentleman who was one of their intimate Friends, and who employs, in the Study of Nature, the Abundance of Leiſure he enjoys.*

The Count de JONVAL, *for that is the Gentleman's Name, diſcovering an extraordinary Penetration and Vivacity in the Son of his Friend, endeavours to cultivate in his Mind the Rudiments of a good Taſte, and a Philoſophy that ſhould always prove advantageous to him. He aſſociates into their Converſations, the Prior-Curate of the Place, a Man valuable for his Knowledge, and one whom a long Share of Piety and Politeneſs had rendered ſtill more engaging. And as the Subjects of their Amuſement were ſome of the moſt common Occurrences, which were no way neceſſary to be illuſtrated by learned Diſputations, the* COUNTESS *had an Inclination to increaſe the Company. All the Remarks the young Gentleman hears on Things which he had till then beheld with Inattention, are entirely new to him, and he never fails, at his Return from Hunting or Fiſhing, with which the Day cloſes, to commit to Writing all he can remember of the Converſation; after which*

which he gives his Journal to the Prior, for his Reviſal and Correction. The Reader may ſuppoſe, that this Journal of their Conference, ſo modelled and retouched, is what we now offer to the Publick.

If theſe Amuſements or Studies, in vacant Hours, have the good Fortune to be pleaſing to Youth, and eſpecially to the Youth of our Nobility, who, as they are frequently in the Country, are more converſant with natural Curioſities; we may hereafter renew theſe Entertainments, and endeavour, to the utmoſt of our Ability, to ſubſtitute a Taſte for amiable Nature and Truth, in the place of the falſe Marvellous of Fable and Romance, that now revives in an hundred new Forms, notwithſtanding the Declenſion it was reduced to by the good Taſte of the laſt Age.

What Labour ſoever we have been at to be informed, either by our own Diligence, or the Friends we could confide in, of moſt of the Remarks on Nature advanced in theſe Converſations; we have ſtill been careful to cite, in the Margin of every DIALOGUE, *the moſt celebrated Authors, who have made the like Obſervations. We did not think it neceſſary to make uſe of what the Ancients have publiſhed upon ſome of theſe Articles, too often with more Credulity than Exactneſs; but the Reader will be more diſpoſed to reliſh what he finds warranted by the Teſtimony of modern Obſervers, who have gained univerſal Reputation by their Accuracy and Circumſpection.*

The Works to which we have had chief Recourſe, for our own Information, and to juſtify our Remarks; are the excellent Hiſtory and Memoirs of the Academy of Sciences; the Philoſophical Tranſactions of the Royal Society at *London* abridged by *Lowthorp*; *the Tracts of* Malphigi, Redi, Willoughby, Leeuwenhoek, Grew, Nieuwentit, Derham, Valliſneri, *&c.*

As we have been ſolicitous to interſperſe, in the ſecond and third Volumes of this Work, thoſe Illuſtrations, which ſome Paſſages in the firſt may require, thoſe who have purchaſed the ſecond Edition of this, will have no Occaſion to buy the third. We acknowledge, indeed, that, beſide theſe neceſſary Improvements and Corrections, we have changed ſome particular Expreſſions, but they relate only to ſuch Points, wherein any former Miſtakes can neither be prejudicial or degrading. Having found, for Inſtance, in taking the Shell of a Lion-Piſmire to Pieces, that the Particles of Sand which compoſe it, are not conſolidated together, but were ſuſpended by ſmall Fibres of Silk, like the Beads of a Chaplet; we thought it proper to obſerve, that theſe Inſects, as well as ſome Species of Caterpillars, that are preparing to diveſt themſelves of their laſt Skins, in order to aſſume the Form of Aurelia's, cover themſelves with a Surface of Sand, not by glewing the Grains of it together, by an Exhalation of Sweat, but rather by uniting them with a viſcous Thread. Eight or ten Remarks of this Nature are not of any conſiderable Conſequence, and add no extraordinary

traordinary Merit to a Book. We have, however, inſerted them, that we might endeavour to be as accurate as poſſible; but have always been cautious not to lengthen, or multiply ſuch Additions, ſince a Profuſion of them would have appeared, to many of our Readers, rather perplexing, than explanatory or improving.

When we write for the Learned, we need not be apprehenſive of degrading ourſelves in their Opinion, by the Minuteneſs of the Subjects we conſider; nor of treſpaſſing upon their Patience, by the Length of the Diſquiſitions, in which we engage; Truth, in all its Forms, is dear to ſuch Perſons, and every new Diſcovery is ſure to obtain their Eſteem. Readers of this Claſs, will undoubtedly be pleaſed with the Natural Hiſtory of Inſects, the firſt Volume of which has been lately publiſhed by Monſieur de Reaumur. *They will there find exact Diviſions, and the moſt inconſiderable Diverſities peculiar to each Species. The Anatomy of Inſects, with their Changes and Operations, are there treated with a Perſpicuity, Copiouſneſs, and Penetration, that leave nothing unexplained. But the Readers for whoſe Improvement we were ſollicitous, are far from expecting this Method from us: On the contrary, if this ſmall Work has obtained a favourable Reception from the Public, that Happineſs reſults from the Accommodation of Materials to the Capacity of young Perſons, and chiefly from the Preference we have conſtantly*

ſtantly given to ſuch Particulars, as could either touch or inſtruct them, with relation to what would otherwiſe have proved a cold and unproductive Branch of Knowledge. We may add, that the Advantage which ariſes from this Precaution, is not to be limited to Youth alone, ſince Perſons of all Ages and States of Life, are deſirous of being affected with pleaſing Impreſſions, and to have their Imaginations filled with the Wonders which are conſtantly exhibited around us by the Deity, in the leaſt as well as the largeſt Objects. The moſt inconſiderable Parts of Nature may, by theſe Means acquire an Air of Dignity and Spirit, and when they can once be rendered engaging, we regard them with Attention and Complacency: But they would immediately ſhrink into their original Minuteneſs, and appear more deſpicable than ever, to the Generality of Readers, ſhould they make them the Subjects of a long and dry Series of Study. Had we proceeded in this Track, our Book would have been rejected with this Reproach, that we treated the inconſiderable Miniature of Nature in a ſcientific Manner. This Cenſure we were unwilling to incur, and have therefore been careful not to croud this Edition, any more than the former, with a Multitude of Particulars, eſpecially in the Article of Inſects; and if this Edition ſhould be thought preferable to the preceding, it may poſſibly owe that Merit to ſome Retrenchments that have been made in more Places than one.

As to thoſe Plates that were either too much worn, or inſufficient for our Purpoſe in any other Particular, it has been thought neceſſary to ſubſtitute new ones in their ſtead. Such for Inſtance, are the Solomon *in the Frontiſpiece, engraven by Monſieur* Cochin; *the Papilio's of Day, and thoſe of Night, engraven by Madam* Cochin; *the large Waſp's Neſt taken from Nature, by the ſame Hand; to which we may add, the Gnats and other Inſects; together with the principal Species of Fiſh and amphibious Animals,* &c. *Thoſe who are deſirous of inſerting them in the former Editions of this Work, may purchaſe them of the Bookſellers at a very moderate Expence, which theſe Plates have unavoidably occaſioned.*

The

The Explanation of the PLATES.

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A. THE Silk-Worm. B. The Head. 1. The Eyes. 2. The Mouth and Spinners. C, One of the hinder Feet. D. One of the fore Feet. E. the Hooks of the Claws repreſented larger. F. The Cone of Silk. G. The ſame laid open, H. The Bean. I. The Spoils of the Worm. K. The Butterfly coming out of its Chryſalis.

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A. The Garden Spider. 1. The Legs. 2. The Arms. 3. The Eyes and Claws, or Pincers. B. The Eyes and Claws at large. C. A larger Delineation of the Eyes and Claws: one of which Claws is at reſt, and bent among ſeveral Points, the other extended. c. The little Aperture thro' which the Spider ejects her Poiſon into the Wound. D. The Extremity of the Leg with its Hairs, its two hooked Claws, in the Form of Saws, its two Sponges, and a Spur projecting out on one Side. E. The wandering Spider with her two Tufts of Feathers. F. The Anus and Duggs. G. The Duggs of different Sorts of Spiders. H. Several Threads which all together form but one. I. The Repoſitories of the Matter out of which the Thread is formed.

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A. The Mule Waſp. B. The Male. C. The Female. D. The Head of the Waſp. E. The Antennæ, or Horns. F. The Saws at reſt. G. The Saws unfolded for Work. H. The

H. The Trunk open. I. The Chryſalis. K. The young Waſp almoſt formed.

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A. The Queen Bee. B. The Drone. C. The common Bee. D. The fore Part of the Head. dd. The Jaws, and the Socket of the Trunk. E. The Trunk for extracting Honey from Flowers. 1, 1. The two Branches that reſt on the Trunk. 2. The two Branches that embrace and enfold the whole. 3. The Joint or Fold of the Trunk. F. The Paw filled with Wax. G. The Extremity of the Paw, with its Hairs, Hooks and Sponges. H. The Sting. 4. The Sheath. 5. The Darts with their Fibres. 6. Drops of Poiſon flowing into the Wound. I. A ſide View of the Cells at their Opening. K. The Cells reverſed. L. The Situation of the Egg at the Bottom of the Cell. M. The young Worm. N. The Worm changed into a Chryſalis. O. The Chryſalis on the Point of its Transformation into a Fly.

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Gnats and other Inſects.

A. The Chryſalis produced by an Aquatick Worm. (a) The Tail lucubrated with Oil, and reſting on the Surface of the Water, while the Chryſalis rears its Head into the Air, or keeps it ſuſpended in the Water. B. The Gnat, ſprung from that Chryſalis, which before encloſed it. (1) The Head and ſmall Plumage. 2. The Antennæ, or Horns. 3. The Trunk that unſheaths the two Darts. A. The Sheath from whence the Darts are launched through a lateral Overture. 4, 5, 6, 7. Different Forms of Darts, which are either all ſhot out at the ſame time, or ſeparately. The whole appears in the Magnitude exhibited in a Microſcrope. C. The Dragon Fly magnified. D. The two Eyes of the Inſect. E. A Mite as it appears in a Microſcope. F. A Piſmire magnified. G. The Mole Cricket, in its natural Dimenſions, and from under whoſe ſcaly Coat two little Wings are expanded. This kind of Tail, which extends to the Extremity, are two other Wings folded up. H. A Flea as it appears in a Microſcope. (a) The three Points which riſe out of the Head, and of which that in the middle ſerves as a Trunk for the Suction of Blood. (b) The long Paws, by whoſe Elaſtick Spring the Creature darts along. (c) The Egg of a Flea at large. (d) The ſame Egg, bruiſed by the Worm that ſprings from it. (e) The Worm which contains the Flea. (f) The Chryſalis diveſted of its Vermicular Skin, and which performs the Function of a Sheath, in which the Paws of the enfolded Flea are viſible. This Formation which is ſo analogous to many others, and ſo regular in the minuteſt Animals, is a Demonſtration that Chance has no Agency in Nature; but that every Part of her Works are meaſured out and compleated by a wiſe Deſign.

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A. The Lion-Piſmire larger than the Life. B. The Lion-Piſmire hid in the Sand at the Bottom of his Ditch, and whirling the Sand on an Ant to prevent its regaining the ſide of the Ditch. C. The Ball of Sand in which the Lion-Piſmire is changed into a Chryſalis. D. The Chryſalis at large. E. The Nymph that proceeds from it. F. An Aquatick Animal out of which ſprings another kind of Nymph.

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A. A Snail. B. The little Shell as it comes out of the Egg. C. The Collar and muſculous Skin, by the Aid of which the Snail marches forwards. D. His four Teleſcopes. E. Several Fractures made in divers Snails, and which have been repaired by their Sweat. F. Several Shell-Fiſh whoſe Channels, Protuberances, and Spots, correſpond to the Channels, Tumours, and different Perforations of the Body, which forms them by ſucceſſive Advances of Growth.

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A. A Bean laid open. 1. The two Lobes containing the firſt Nouriſhment of the Bud. 2. The little Plant or Bud. 3. The little Root. 4. The Fibres of the two branched Tubes that are tending to unite together at the little Root. B. An Acron in its Cup. C. The Root of a little Oak riſing firſt upwards, and then bending to the Earth. D. The little Root of a Bud, at firſt forced to aſcend by meeting with ſome hard Body, and then turning downwards to the Earth; as it is ſeen in E. F. The Bud of a Gourd, as it appears through a Microſcope on the Top of the Kernel. 5. The ſeminal Leaves clapped together, and containing the little Plant. 6. The little Root. 7. The ſeminal Leaves and little Root beginning to grow in the Seed. 8. The ſeminal Leaves ſprouting out of the Earth. 9. The Root fortified and extending its Fibres in the Earth. 10. The little Plant beginning to ſhoot out its proper Leaves from between the two ſeminal Leaves; one of which is bent down in 11. G. The Kernal of an Orange which contained two Buds, and has ſhot forth two Stems. 12. The ſeminal Leaves. 13. The Lobes of the Kernel which are become uſeleſs, and are rotten in the Earth.

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A. The Fibres of the Wood. B. The Meſhes thro' which the Rounds of the *Utriculi*, or little Bags paſs. C. The Rounds of little Bags placed horizontally. D. The Air-Vents, always empty, of an equal Bigneſs, and compoſed of ſpiral Fibres. E. Tranſverſe Fibres, which make the Wood hard to ſplit, and terminate in the Knots, the Buds, and the Pedicles of the Leaves and Fruits. F. The Trunk of a young Tree of two Years Growth cut horizontally. 1. The *Epidermis*. 2. The groſs Bark. 3. The fine Bark. 4. The ſappy Part, or the Wood of the laſt Year. 5. The Wood of the firſt. 6. The *Utriculi* of the Pith. 7. The *Utriculi* that go from the Bark to the Pith. G. Part of the Inſide of a Vine-Branch cut horizontally, and ſhewing the Orifices of the Veſſels from one ſide of the Bark to the Pith. 8. The Place of the Bark which is taken away. 9. The three Rows of *Utriculi*, two of which go to the Pith. 10. The third ends in the Thickneſs of the Fibres. 10. The *Utriculi* of the Pith, larger than the horizontal ones. 11. The Orifices of the Veſſels cut, which are the Fibres, the proper Veſſels, and the Air-Vents; the largeſt Openings are thoſe of the Air-Vents.

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1. A Tree planted on a Level. 2. A right Angle. 3. A Tree planted on a Declivity. 4. An acute Angle,

or narrower than a right one. 5. An obtuſe Angle, or wider than a right one. A. An open Flower. 1. The Petals or Leaves of the Flower. 2. The Piſtil, the Top of which is a long Pipe, and its Bottom in the Heart of the Flower is a Capſule containing the Seed. 3. The Tops containing a reſinous Duſt, they are ſuſtained by the Threads or Chieves. B. The Tulip, with its Chieves higher than the Piſtil. C. The Crown Imperial. 4. The Tops. 5. The Piſtils longer than the Chieves. D. The Lilly, with its Piſtil longer than the Chieves. E. One of the Piſtils that cover the Bottom of the Sunflower, containing one Seed towards the Bottom. 6. A brown Bag full of a yellow Duſt. 7. The Tube of the Piſtil perforated with ſeveral little Holes. 8. Part of the little Bell that encompaſſes the Bottom of the brown Bag; this Figure ſhews it as it is by a Microſcope.

All the Veſſels are here repreſented larger than Nature.

INSECTS.

DIALOGUE. I.

The Count de JONVAL.
The Prior de JONVAL.
The Chevalier du BREUIL.

Count. IF we intend to take our uſual Walk, it is time to prepare for it. It grows late: Let us be gone.

Chevalier. Here's the *Prior* come very ſeaſonably to make one of the Party.

Prior. Gentlemen, I invite you to take the Air, and amuſe yourſelves in the Garden: we muſt turn the Chevalier out of this Cloſet, where I always find him. Would not one be apt to ſay, it was ſome Poſt given him to make good?

Chevalier. I am always uneaſy to leave it: The Count has filled this, and the two next Apartments, with ſo many Curioſities, that one can never be tired with beholding them.

Count. Do you think ſo, Sir? No: *Paris,* from whence you come, is the Place where you muſt look for Objects to pleaſe your Eyes: Here you will meet with nothing but plain Nature.

Chevalier. She is a thouſand times more engaging than all the Glitter and Gildings of *Paris.* We are ſoon weary of ſeeing always the ſame things, but here is a ſurprizing Variety: I believe, there is nothing brought from the four Quarters of the World, but what may be ſeen in this

Place. The Count among other Things, muſt needs have collected Animals of every Species one can imagine. Some of them are of Nature's Creation, perfectly well dried and preſerved, others are to be ſeen here in Pictures at leaſt. But nothing gives me more Pleaſure than this Multitude of little Creatures, who are living; ſome are working in the Window under a Glaſs Hive; others ſpin, or employ themſelves after their manner, in cryſtal Veſſels. How delightful is it to live in the Country! It daily produces ſomething new.

Count. Every Perſon has a particular Manner of thinking: the Army, and the buſy Scenes of Life, have taught me to value Retirement; it pleaſes me, and has made me paſs a great deal of my time very much to my Satisfaction; this Variety of Amuſements renders it agreeable, and I may even ſay advantageous to me; but a Gentleman of your Age has ſeldom an Inclination to enter upon the Anatomy of an Inſect; and ſuch Objects as Butterflies, and Silk-Worms, Ants, and Bees, muſt be very languiſhing Entertainments, for Eyes like yours.

Chevalier. Since you have made me acquainted with the Uſe of magnifying Glaſſes, I have ſeen admirable Things in Inſects. The ſingle Head of a Fly is covered with Flowers and Diamonds; the Wing of a Gnat, which, at the firſt View, looks like a ſmall white Rag, and ſeems deſtitute of all manner of Beauty, appears, when you conſider it attentively, as ſmooth as a Mirror, and glows like a Rainbow. I ſhall never be eaſy, 'till I have examined all the reſt with the ſame Exactneſs.

Count. You deſign then to be a Man of Singularity. But tell me, Sir, do you meet with any one who amuſes himſelf with the Study of Inſects? We commonly deſtroy them, at leaſt they are not much regarded. If you intend to regulate your Pleaſures by mine, you will chuſe a very unfaſhionable Model. To enjoy rational Delights, according to the gay Taſte, a Man muſt be charmed with the Hurry of *Paris*, dreſs up to the Mode, fix his Choice of a ſhining Equipage with a great deal of Attention, and not forget the Accompliſhment of a peculiar Snuff-Box; the Morning muſt be employed in writing down the Articles of a Collation, and, when that important Affair is diſpatched, he muſt paſs the reſt of the Day in Viſits, or Play; he ought to reliſh the magick Feats of an Opera, and the frolick Dexterities of *Harlequin* at a Fair. Theſe are your polite People, and this is the Turn of Mind which has nothing in it to be reproached. But to ſpend three Parts of the Year, like me, in the Country, and make the Study of the various Scenes of Nature one's Delight; to examine, for Inſtance, the Structure of an Animal's Body, to trace a Plant from its Original through all its Progreſs, and inform one's ſelf, by repeated Experiments, of its particular Uſefulneſs; I ſay, Sir, What do you think of this? Don't you find ſomething very ruſtick in ſuch a Life, and a great deal of the Caſt of a dreaming Philoſopher?

Chevalier. I conceive your Lordſhip's Meaning: you would give me to underſtand, that Men judge wrong; prize Trifles, and neglect what is truly fine and ſatisfactory.

Count. Since you enter into my Thoughts ſo juſtly, I will talk to you without Reſerve. The View of Nature enchants me, and I find new Pleaſures in it every Day, even with reſpect to the minuteſt Objects. Let us not begin with ſurveying thoſe immenſe Globes of Fire that roll above us, nor this Earth which unfolds ſo many Treaſures to our View. Let us firſt conſider the ſmalleſt Objects, we may afterwards aſcend by Degrees. The Scene we behold is truly magnificent, but that which our View cannot take in at once, we may divide and enjoy by Parts.

The Deſign of the Work.

Inſects.

Let us begin with theſe Inſects, ſo much deſpiſed by others, but of which you are ſo fond of. I aſſure you, they infinitely delight me by their Variety, their Diſpoſitions, their Policy, and the wonderful Proportion of their Organs, as well as by a hundred Curioſities I obſerve in them. If the Deity did not think it unworthy of himſelf to create them, is it beneath us to conſider them? But when we examine them in a nearer View, they afford us infinite Matter of Aſtoniſhment. Judge, then, Sir, by what is moſt obvious and familiar to our Obſervation, how much that which lyes concealed from our Eyes and Reaſon, would ſurprize us, were it diveſted of its Veil.

The Definition and Diviſion of Inſects.

Every Inſect, whether it flies or creeps, is a little Animal, compoſed either of ſeveral Rings, which ſhrink from or approach one another in a common Membrane that collects them; or elſe of ſeveral diſtinct Scales, that ſlide over one another; or laſtly, of two or three principal Parts, connected by a Thread they call a Ligature.

Of the firſt ſort are all Worms, as well thoſe who have Feet, as thoſe who are without them. When they would paſs from one Place to another, they dilate the muſculous Skin that ſeparates the firſt Ring from the next. They advance the firſt Ring, whether it be near the Head or Tail, to a certain Diſtance; and then, by contracting and expanding the Skin of that Part, they move the ſecond Ring; the ſame Effort draws the third, and ſo the whole Body marches in Succeſſion. In this manner thoſe little Animals, even without Feet, move and transfer themſelves where they pleaſe; riſe out of the Earth, and retire into it, at the Appearance of the leaſt Danger, and advance and retreat as Need requires.

Of the ſecond ſort are Flies, and *May-birds*, beſides an infinite Variety of others, whoſe Body is an Aſſemblage of many little Scales, which dilate by unfolding themſelves, or contract by ſliding over one another, like Braſſets or Cuiſſes, in our old Suits of Armour.

Chev. Your Lordſhip has ſhewn me ſeveral of them in your Wardrobe.

Count. Of the third ſort are Ants, Spiders, and ſeveral others, that you ſee divided into two or three Parts, which hardly appear to be connected with each other. It ſhould ſeem that the Term *Inſect*, which is appropriated to all theſe ſeparate Parts, Sections and moving Rings, is derived from a *Latin* Word which ſignifies *to cut*, and is applied, in general, to all theſe little Creatures.

Inſecare to cut.

Prior. Their Minuteneſs ſeems, at firſt View, to juſtify the Contempt we entertain of them: but, in reality it affords us freſh Reaſon to admire the Art and Mechaniſm of their Structure, which aſſociates ſo many Veſſels, Fluids and Movements, in a Point that is frequently imperceptible. Vulgar Prejudice conſiders them as the Effect of Chance, or the Refuſe of Nature, but an attentive Eye diſcovers

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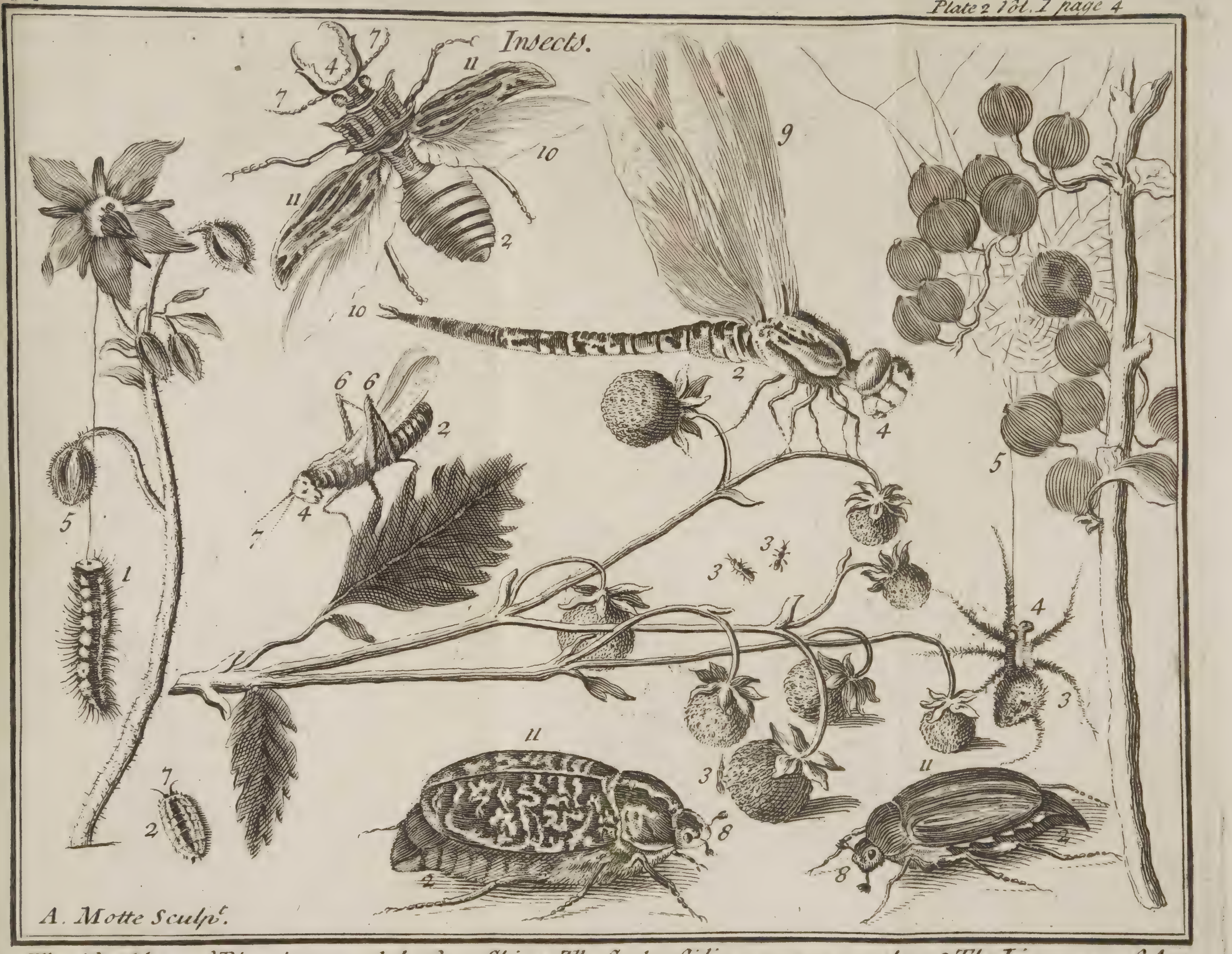

1 The Aſsemblage of Rings in one and the ſame Skin. 2 The Scales ſliding over one another. 3 The Ligaments of Ants, Spiders &c. 4 The Teeth or Saws. 5 Inſects ſuſpended by their Thread. 6 The Springs of the Graſs-hopper. 7 The Horns or Antennæ. 8 The Horns or Antennæ in the form of a Comb. 9 The Wings of a Dragon Fly. 10 The Wings of a Beetle. 11 The Caſe of the Wings.

in them a Wiſdom, which, far from neglecting them, has been particularly careful to cloath, arm and accommodate them with all the Inſtruments neceſſary to their Condition.

Their Cloathing.

This Wiſdom has array'd them, even to a degree of Complaiſance, by laying out ſuch a Profuſion of Azure, Green and Vermilion, Gold, Silver and Diamonds, Fringe and Plumage, upon their Robes, their Wings and the Ornament of their Heads. We need only behold the Ichneumon, *Spaniſh* Dragon, and Butterflies, nay a Caterpillar itſelf, to aſtoniſh us with this Magnificence.

Their Arms offenſive and defenſive.

The ſame Sagacity, which has been ſo liberal in their Ornaments, has completely armed and put them into a Condition of making War, and aſſaulting their Enemies as well as defending themſelves. If they don't always ſeize the Prey they watch for, or eſcape what is prejudicial to them, they are at leaſt furniſhed with the moſt proper Abilities for ſucceeding in their Deſigns. The Generality of them are provided with ſtrong Teeth, a double Saw, a Sting with two Darts, or vigorous Claws, and a ſcaly Coat of Mail covers and defends their whole Body. Thoſe whoſe Nature is the moſt delicate, are fortified with a thick Skin, which weakens thoſe Frictions and Encounters that might injure them. The Safety of the greateſt Part of them, conſiſts in the Agility of their Flight, and, by that means, they evade the Danger that threatens them: Some by the Aſſiſtance of their Wings, others by a Thread that ſupports them, when, from the Leaves on which they live, they ſuddenly throw themſelves at a Diſtance from their Enemy; and others by the Spring of their hind Feet, whoſe Elaſticity immediately launches them out of the Reach of Inſult. In a word, when they are deſtitute of Force, Stratagem ſupplies its Place: And the perpetual War we ſee among Animals, furniſhes moſt of them with their ordinary Subſiſtance, and at the ſame time preſerves a ſufficient Number of the Species, to perpetuate the Individuals.

Their Organs and Implements.

Without doubt, you are ſurprized to ſee Nature ſo careful in the Equipage and Attire of theſe Inſects we deſpiſe; but your Wonder would be different, were you to take a particular Survey of the Organs ſhe has given them for their Support, and the Implements each of them work with, according to their different Profeſſions, for every one has its own. Some ſpin, and have a couple of Diſtaffs, and Fingers, to form their Thread; others make Nets and Lawn, and for that Purpoſe are provided with Shuttles and Clews of Thread. There are ſome who build in Wood, and are therefore ſupplied with two Bills for cutting their Timber. Others make Wax, and have their Shops furniſhed with *Rakers*, Ladles and Trowels. Moſt of them have a Trunk, more wonderful for its various Uſes than the Elephant's, and which, to ſome, ſerves as an Alembic for the Diſtillation of a Syrup, Man could never imitate. To others it performs the Office of a Tongue; many employ it as a Drill for piercing, and the Generality of them uſe it as a Reed for Suction. Several, whoſe Heads are fortified with a Trunk, a Saw, or a couple of Pincers, carry, in the other Extremity of their Bodies an Auger, which they lengthen and turn at Diſcretion; and by that means dig commodious Habitations for their Families, in the Heart of Fruits, under the Bark of Trees, in the Subſtance of Leaves or Gems, and frequently in the hardeſt Wood itſelf. There are few who have excellent Eyes, but have likewiſe the additional Benefit of a couple of Horns or Antennæ, that defend them, and which, as the Animal moves along, eſpecially in the Dark, make a Trial of the Way, and diſcover, by a quick and delicate Senſation, what would defile, drown or endanger them. If theſe Horns are moiſtened in any injurious Liquor, or bend by the Reſiſtance of a ſolid Body, the Animal is warned of the Danger, and turns another way. Some of theſe Horns are compoſed of ſmall Knots, like thoſe on the Heads of Crayfiſh, others terminate in the Form of a Comb; a third ſort are covered with little Plumes, or tufted with Velvet, in order to be preſerved from Humidity. Beſides theſe and many other Aſſiſtances, which vary according to the Species, moſt Inſects have alſo the Gift of Flying: Some, as the Dragon Fly, have four large Wings, which correſpond with the Length of their Bodies; others, whoſe Wings are of that exquiſite Fineneſs that the leaſt Friction would tear them, have two ſtrong Scales which they raiſe and fall like a Pair of Wings, but which are no more than a Caſe for the real ones. You will find Beetles, *May* Birds and

Spaniſh Flies, furniſhed with theſe Caſes. You may alſo obſerve Numbers who have only two Wings, but under theſe you will perceive as many Bladders, or hollow Veſſels, which are thought by ſome * to be a Couple of Weights, or a kind of Counterpoiſe, by the Aſſiſtance of which the Inſect ſupports itſelf againſt the Agitation of the Air, and continues in an Equilibrium, like a Rope-Dancer who poiſes himſelf with a Pole that has a Weight of Lead at each Extremity; though perhaps theſe hollow Veſſels may be judged to be two Caſtenets, which the Inſects ſtrike with their Wings for their Diverſion, or elſe to make themſelves known to one another by the buzzing Sound.

Count. I ſee, Sir, by your attentive Air, that we ſhall make you a Philoſopher.

Chev. As your Lordſhip does me the Favour to let me continue here for ſome time, I ſhall be Maſter of a Treaſure at your Expence. With your Permiſſion, I ſhall aſk you a hundred Queſtions every Day. I am preparing to make the whole Claſs of Animals paſs in Review before us. I ſhall be perpetually breaking in upon you, and don't intend to give you a Moment's Reſt, till I have robbed you of all your Knowledge.

Count. You may begin your Attack when you pleaſe; we ſhall endeavour to defend ourſelves.

Chev. In the firſt place: I ſhall beg the Favour of your Lordſhip, after our Walk, or when it better ſuits you, to let me ſee, in a Microſcope, theſe Habits, Arms, and Implements, of which you have told me ſuch Wonders. According to your Deſcription, Inſects are as gaily dreſs'd as ourſelves, and their Tools as neatly made as thoſe of our beſt Mechanicks.

Prior. We may very well compare, as you do, Sir, the Inſtruments and Habits of Inſects with our own; but then it muſt only be in order to diſcover the Inaccuracy of our Works, and the Richneſs, the Elegance and infinite Superiority that ſhine in thoſe of Nature. Obſerve the Head of a common Fly in a magnifying Glaſs. † One can never be ſatiated with ſeeing ſuch a Profuſion of Gold and

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* Derham, Theol. Phyſ. l. viii.

† Explic. litt. de l'ouvr. de ſex jours.

Pearls on a Head ſo inconſiderable, and comparing it with a ſecret Compaſſion, with ſome other Heads that affect the like Ornaments, without being able to imitate them. What has been ſaid of the Lillies of the Field, is applicable to Ichneumon Flies, and a Variety of other Species: *Solomon, in all his Glory, was not arrayed like the* meaneſt among them. But we muſt return to what the *Chevalier* has already ſeen. Do you remember, Sir, what you obſerved at my Houſe, when you oblig'd me with a Viſit? You took my Microſcope: What had I fixed in it?

Chev. On one Side you had placed the Sting of a Bee, glewed upon a little Piece of Paper; and on the other a ſmall Needle, ſo very fine that one could ſcarce finger it.

Prior. How did the Sting appear to you?

Chev. It was moſt beautifully poliſhed from End to End, and the Point was not to be diſcerned.

Prior. Obſerve one thing however, which I did not mention to you then. At a ſmall Diſtance from the Point, is an Orifice, through which the Bee launches two little Darts of an inexpreſſible Fineneſs, and yet very ſtrong and efficacious; ſo that what you ſaw, and is commonly obſerved to come from the Body of a Bee, is not properly the Sting; but the Sheath, or a kind of Augur, to prepare an Orifice for the two Darts, in order to give them a deeper Penetration. But how did the little Needle appear?

Chev. All blunt and rugged, like a Bar of Iron out of a Smith's Forge.

Prior. The Compariſon is juſt, Sir; and indeed 'tis the ſame in every thing elſe: In the Works of Man, you ſee nothing but Ruggedneſs, Gaps and Inequalities; the Limits of his Induſtry, and the Coarſeneſs of the Inſtruments he employs, are evident thro' the whole; every thing looks as if it had been made with an Axe or a Trowel, and diſcovers an unſkilful Artiſt, not at all acquainted with the Matter he works upon. On the contrary, the ſmalleſt Works of the Creator are perfect. In their interior Parts you will always find a Freedom, a Plainneſs and a Set of Springs, whoſe Art, Structure and Correſpondence are known by him alone. In their exterior, you will conſtantly meet with the fineſt Touches of the Pencil, with Magnificence, Symmetry and amiable Graces diffuſed through the whole.

Chev. I am determined to ſtudy all the Inſects that fall in my way, and mean to be acquainted with the whole Tribe.

Prior. Shew them no Quarter, eſpecially thoſe whoſe Colours are touched up with Luſtre. I pity every Papilio and Ichneumon Fly that ſhall happen to be near you. However, as the *Chevalier* is ſo curious about Inſects, 'tis eaſy to give him Satisfaction. Let us entertain him with an Account of the various Changes thro' which they paſs, and their different Species: By theſe Means he will collect thoſe which pleaſe him moſt, range them in better Order, and grow acquainted with his whole Retinue.

The Origin of Inſects. Their firſt State.

Count. With all my heart: Let us begin then with their Birth. Every Inſect is generated, like other Animals, from a Seed which contains the Inſect in Miniature. This Seed is at firſt wrapped up in a ſingle or double Covering, which opens when the young Animal has acquired Strength enough to pierce through it. If the little Creature breaks through its Incloſure at the Birth, and comes into the World compleatly formed, and like its Dam, this latter is ſaid to be *Viviparous*. Of this Species are the Palmer, and a Variety of Inſects that are to be found on ſeveral Plants, and Orange Trees. But when the Female-Parent produces her Young in a hard Incloſure, which is called an Egg, and in which they continue for ſome Time, ſhe is ſaid to be *Oviparous*.

Among the *Viviparous* Species, the Incloſure where the Seed is lodged, is ſoft and delicate; becauſe as the Young is always inveſted with a Cover, while it continues in the Womb of its Mother, it is not requiſite that the Seed ſhould have any ſtronger Defence. In the *Oviparous* Kind, the Covering which infolds the Seed, a little before the teeming of the Dam, becomes a ſolid Incruſtation, to protect the Young from the Weight, and Injuries of the Air, which rolls over the Egg, as upon the Surface of a Vault, without occaſioning the leaſt Prejudice to the tender Animal who is lodged in that Incloſure.

All Inſects, and Animals in general, are derived, without Exception, from a female Parent, who introduces them into the World by one of theſe two Operations of Birth. The *Oviparous* Species always lay Eggs, from whence the Young proceed, after a certain Period of Time, and by the Aid of a particular Degree of Warmth. The *Viviparous* Kinds never fail to produce their Young compleatly formed: Theſe Laws have ſubſiſted from the Beginning of the World, and were never ſubject to the leaſt Variation.

Chev. How, my Lord, has an Inſect, and even a creeping Worm, had a Mother, like a Lion, who is the Offſpring of a Lioneſs?

Count. The Fact is inconteſtable. A Lion has had a Mother, who likewiſe proceeded from a Parent of the ſame Nature. This alſo ſprung from the like Original, and all thoſe Generations were united in the firſt Lioneſs, that God created upon the Face of the Earth. The ſame may be ſaid of each Species of Inſects, whoſe Generations are equally ſucceſſive, regular, and invariable.

An Objection againſt the regular Generation of Animals.

Chev. How can we reconcile all this, with what is daily preſented to our View? Do we not ſee Inſects riſe to Life, in a hundred Places where none were to be found before? When a Body has been reduced to a State of Putrefaction, ſome Species of Inſects ſprings from it, and it is generally ſaid, that they are engender'd from Corruption.

Count. This indeed is the common Opinion; but can you believe my dear *Chevalier*, that when People expreſs themſelves in this manner, they underſtand what they talk about? What is meant by the Corruption of a Body? 'Tis the Diſſolution of its Parts. For Inſtance, Meats and Wine turn to Putrefaction, when the Air, and eſpecially a warm Air, penetrating thoſe Proviſions on all Sides, diſſipates their fineſt Parts, and leaves only thoſe that are more groſs, and leſs proper, either to nouriſh the Body, or regale the Palate. 'Tis not to be conceived, that the inward Parts of a Piece of Meat, after ſuch a Diſſipation, Change, and Solution, are, all at once, better diſpoſed to form an organized Body, furniſhed with Eyes, a Heart, and Inteſtines; or, in a word, all the conſtituent Parts of a living Animal.

Chev. How, my Lord! do you believe that a Worm, or a Caterpillar, has all you have mentioned?

Count. The leaſt Worm, or the ſmalleſt Mite once can poſſibly diſcover in Cheeſe, the minuteſt Eel viſible in Vinegar *, and the moſt diminutive Worm that plays ſo nimbly in other Liquors, have, each of them, the Parts I have enumerated. 'Tis an Animal that ſees, and turns aſide when interrupted in its Way; it ſeeks out its proper Food, eats and digeſts. It muſt needs have all that in little which we poſſeſs in larger Dimenſions.

Prior. I would as ſoon ſay, that Rocks and Woods engender Stags and Elephants, as affirm, that a Piece of Cheeſe generates Mites. Stags are born and live in Woods, and Mites in Cheeſe; but they both owe their Being to that of other Animals.

Count. Microſcopes, and the Anatomy of Inſects, have demonſtrated this Truth; and their uniform and regular Generation was formerly a Myſtery, which at laſt has been ſufficiently cleared up.

Prior. We muſt convince the Gentleman of this by ſome new Proofs. The common Opinion that Inſects riſe from Putrefaction, is injurious to the Creator, and diſhonourable to our own Reaſon. For if we beſtow the leaſt Attention on theſe minute Animals, who are formed with ſo much Symmetry and Art, and ſo wiſely accommodated with all the Inſtruments they want, and who perpetuate themſelves in a Form that never varies, we muſt either confeſs them to be the Production of Almighty Wiſdom, or the Offspring of Chance, and the accidental Concourſe of ſome Humours that have been changed and diſplaced. Now 'tis the laſt Abſurdity to aſcribe Agency to Chance; nor is it at all better to ſay, Chance acts with any Deſign, Precaution or Uniformity. The ſame Wiſdom, therefore, that appears ſo admirable in the Structure of an human Body, is as viſible in the Compoſition of an Inſect; And Corruption is no more the Parent of theſe, than it is of other Animals, or even Men themſelves. Our next Buſineſs therefore is to enquire, whether Inſects, wherever they appear, owe their Exiſtence to a new and extraordinary Creation, or whether they are generated from a Seed, with which God, in the Beginning, impregnated every Species, and wherein he has plan'd and depoſited the Organs of future Animals, in Miniature; in order to their being diſengaged and unfolded by Time. This laſt Opinion ſeems moſt conformable to Reaſon and Experience, to the Omnipotence of God, and to the ſacred Writings; which inform us, that God, in the Beginning commanded every Plant to have Seed in itſelf, of its own Reſemblance, and every Animal to multiply according to its Species.

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* See the Tables of *Leeuwenbock*, under the Word *Animalcula.*

Chev. I begin to ſee that Things are as you repreſent them. We find it difficult, however, to diveſt our Minds of the Notion, that Inſects are engender'd by Corruption: for, as ſoon as either Wood, or Meat begins to putrify, we ſee them ſwarm with Inſects. What is it that produces them?

Count. Nothing can be more natural. They are born in ſuch Parcels of Matter, becauſe other Inſects have laid their Eggs there.

Chev. But then, my Lord, thoſe Eggs muſt be univerſally diſtributed, and repleniſh every Place; for otherwiſe, ſeveral things would putrify, without producing Worms.

Prior. The Gentleman is embaraſſed, becauſe he ſees Worms always appear where there is any Corruption. This inclines him to think, that Eggs are lodged in every Place, and only hatched where they meet with Juices proper to ſwell and nouriſh the Seed.

Chev. I have heard the *Count* ſay, that the little Seeds of Plants are wafted by the Wind, and diſperſed all about, and that, at laſt, they begin to ſprout, when they meet with Juices convenient for them. May we not ſuppoſe too, that the Eggs of Inſects are every where diſtributed up and down? and that ——

Count. Have not I told you we ſhould make you a Philoſopher? Your Father and Tutor will find you, at your Return, a perfect Maſter of Phyſicks. And I am very glad, Sir, you have ſtruck into ſuch a Train of Reaſoning. Several of the Ancients and Moderns have entertained the ſame Opinion: But don't attribute too much to it. For the Suppoſition, that the Eggs of Inſects are diſperſed in the ſame Manner as the Seeds of Plants, though it may ſeem ſo very ſpecious, is not altogether exact. You yourſelf ſhall judge.

A Plant that bears Seed, is fixed in the Earth, and cannot transfer them to any other Place; for this Reaſon, Nature, if I may uſe the Expreſſion, has given Wings to theſe Seeds, to prevent their falling all in one Place. Some burſt their Shells with great Vigour, and ſcatter themſelves over a large Extent of Land; others are really furniſhed with little Wings, which convey them by the Aſſiſtance of the Wind, to a great Diſtance; and others, beſide this Advantage, have ſmall Hooks, that, in ſpite of the Wind, fix them to ſome particular Place. The Deſign of the Author of Nature could not have a more evident diſplay, and it appears no leſs in the Diſpoſition of Inſects Eggs; but then the Manner is very different; for where-ever you meet with any of theſe, you will find them faſtened by a Glew ſo tenacious, that 'tis ſometimes impoſſible to diſengage them, without entirely breaking them; or elſe they are ſhut up in little Cells of different Forms, but all built with Art, and cautiouſly defended. From whence it appears, that Nature never intended theſe Eggs ſhould be wafted up and down, but rather that they ſhould be fixed in ſome certain Place.

Chev. No more of my Compariſon: I renounce it intirely.

Count. I have not yet given you a ſufficient Idea of the different Situation of the Seeds of Plants, and the Eggs of Inſects: The former are entirely abandoned to the Wind; from whence we infer, they ought to be ſcattered up and down, though they are not to take Root whereever they fall, but in ſuch Places only, where they meet with Juices proportioned to the Smallneſs of their Pores. But the Fact is quite otherwiſe, with reſpect to the Eggs of Inſects: They are unprovided with Wings, to transfer them to different Parts; but then their Parents can fly, and find out convenient Lodgments for them. And therefore if you always ſee Inſects in a Body, as ſoon as it begins to corrupt, it is not becauſe theſe Animals are ingendered by Putrefaction, or that the Eggs of Inſects are every where ſcattered and diſtributed; but 'tis only becauſe they have Mothers, who know that impaired and corrupt Bodies afford the propereſt Nouriſhment for their Young:

They are attracted by the Odour, which exhales to a great Diſtance; nay, this very Odour was appointed to act upon them by ſuch an Attraction. And, in general, the Choice of the Parent to lay her Eggs in a Place that abounds with convenient Nouriſhment for her Young, preferably to any other Situation, is as proper as the original Diſpoſition itſelf of thoſe Young, to demonſtrate, that Corruption cannot ingender any Being, that Chance has no Agency; and laſtly, that 'tis only Nature herſelf who preſcribes to every Animal its Place, its Functions, and its Food.

Prior. If Chance does not any way interpoſe in placing the Eggs of Inſects, it has ſtill leſs to do in forming them.

Count. Nothing happens here by Chance. The Motions of minute Animals ſeem indeed accidental and capricious, but they as really tend to a certain Point as thoſe of the largeſt Beings. We ſhall find all the Sagacity we admire in a Fox, for chuſing himſelf an advantageous Kennel, and the ſame Induſtry with which we ſee a Bird make itſelf a convenient Neſt; I ſay, we ſhall find all this actuating a little Fly, in her Choice of a commodious Manſion for her minute Poſterity. No Inſect abandons her Eggs to Chance, and the Parent is never deceiv'd in the Choice of a proper Situation for them. If therefore the Young find immediate Nouriſhment when they forſake the Eggs, 'tis becauſe the Mother has preciſely choſen the propereſt Place for their Support. Diſſolve a Grain of Pepper in Water, and you will commonly ſee Worms of an incredible Smallneſs ſwimming in the Fluid. The Parent, who knows this to be their proper Nouriſhment, never lays her Eggs in any other Place. Look at a Drop of Vinegar with a Microſcope, there you will diſcover a Number of little Eels, and never any other Animals; becauſe one particular Creature knows that Vinegar, or the Materials which compound it, is proper for her Family, and therefore depoſits them either in that Matter, or the Liquor itſelf, and no where elſe. In thoſe Countries where the Silk-Worm feeds at large in the Fields, her Eggs are only to be found on the Mulberry-tree. 'Tis eaſy to ſee what Intereſt determines her to this Choice. You will never find upon a Cabbage, any Eggs of that

Caterpillar who eats the Willow, nor ſee upon a Willow the Eggs of any Caterpillar who feeds upon Cabbage. The Moth ſeeks for Curtains, Woollen Stuffs, dreſſed Skins, or even Paper, becauſe its Materials are Fragments of Cloth which have loſt the bitter Flavour of Hemp, by the working of the Paper-mill. But you will never meet with this Creature, either in a Plant, or Wood, or even in putrified Meat. On the contrary, 'tis in this laſt, that the Fly depoſits her Eggs. What Intereſt attracts her there? Would not her Eggs be better lodg'd in a fine *China* Vaſe, which ſhe might always uſe as ſhe pleaſed? —— Experience will convince you better what it is that regulates her Choice.

Take a Slice of Beef newly killed*, and put it into an open Pot; put likewiſe another Slice into a Pot that's very clean, and cover it immediately with a Piece of Silk, ſo that the Air may tranſpire, and the Flies be prevented from ſliding their Eggs into the Veſſel. The firſt Slice will undergo the common Conſequence; becauſe the Flies have their full Liberty to lay their Eggs. The other Piece will change and decay by the Admiſſion of the Air; and at laſt be reduc'd to Powder by Evaporation; but neither Eggs, Worms, nor Flies will be found there: The moſt that can happen will be this, the Flies allured by the exhaling Odour, will ſettle in Swarms upon the Cover, and endeavour to enter; but at laſt will leave their Eggs upon the Silk, being unable to penetrate any farther.

Prior. This Inſtance makes it evident, that Corruption cannot ingender any Animal, and indeed, ſeveral Inſects ſeek what is quite different from it, to lodge and nouriſh their Young. But if ſome Animals live in Putrefaction, 'tis no more ſurprizing to ſee them lay their Eggs in a Body tending to Corruption, than it is to view the Mother of a Family, and her Children, working with Sickles in a Field of ripe Corn. All Nature is full of Animals, ſome fixed to one kind of Nouriſhment, others to a different. All of them have their Eyes attentive on their Prey, and nothing eludes their Penetration.

Chev. I now begin to ſee more Order and Deſign in the Conduct of the leaſt Animals, than I before imagin'd.

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* See the Experiments of *Redi*, *Arezzo* and *Leuwenhoek*'s Anat. & Contempl. Arcan. Nat. Tom. I.

Prior. The more you come to particulars, as amazing as the Variety of Species, and their different Manner of ſubſiſting may appear, you will, thro' the whole, ſee repeated Traces of the ſame Wiſdom which inſpires each Parent with a tender Solicitude for her Poſterity, and works, if I may ſo expreſs myſelf, by the ſame Plan, in referring every Species to the ſame Original; I mean a Generation by Eggs, or the Seed lodged in them.

The Egg.

Count. Let us now ſee what an Egg contains. When the Female who produces it, has not had any Commerce with the Male, it is only repleniſhed with a barren Nouriſhment, that ſoon dries and evaporates. 'Tis the Male that gives the Egg its Fecundity; and then, beſides the fine Aliment the Shell incloſes, there is lodged in it a minute Animal, which no Hand, but that of the Deity could form, with a Reſemblance to its Female Parent. This little Creature, protected by the Shell that ſurrounds it, in conſequence of a Law that ſurpaſſes all our Knowledge, is gently nouriſhed by the Fluid in which it ſwims. It increaſes in Bulk, and at length, perceiving its Habitation too contracted, breaks its Incloſure, and immediately finds itſelf accommodated, by the Wiſe Precaution of its Mother, with a Food more ſtrong and ſuitable to its new Condition.

Their ſecond State.

Some when they leave the Egg, have their perfect Form, which they never loſe as long as they live. Of this Kind are Snails, who quit the Egg with their Houſe on their Back. They always preſerve the ſame Shape and Habitation, only when they grow larger, ſome new Circles are added to their Shells. Under the ſame Claſs we may rank Spiders*, who are perfectly formed when they come out of the Egg, and only change their Skin and Bulk. But the Generality of other Inſects paſs through many Varieties of Being, and aſſume the Form of two or three Animals ſucceſſively, who have no Reſemblance to one another.

Chev. How, my Lord! Will a Caterpillar ever be any thing but a Caterpillar? And has a Bee ever been any Animal different from a Bee.

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* *Leuwenhoek*'s Arcan. Nat. Tom. iii. Epiſt 138.

Count. Without doubt. There is an infinite Number of theſe little Animals who are compoſed of two or three Bodies very differently organized, the ſecond of which unfolds itſelf after the firſt, and the third receives its Birth from the ſecond. Theſe are ſo many Metamorphoſis. Have you never ſeen thoſe of *Ovid*, Sir?

Chev. I am now reading them, and have gone through half of that Work. Thoſe agreeable Fables divert me exceedingly; but, after all, they are but Fables, unleſs they contain ſome hidden Meaning; and that is what I wiſh ſomebody would diſcover to me.

Count. You are in the right, and ſhould give no Quarter to thoſe who let you into their Explanation. In reading them, you muſt endeavour to unravel thoſe ancient Hiſtories that lye diſguiſed under ſome of theſe Fictions, as well as thoſe equivocal Expreſſions of the ancient Languages, that have given Birth to others. But ſince I find you as much a Friend to Truth as you are to the Marvellous, I ſhall charge myſelf with the Care of all your Pleaſures, and intend to bring you acquainted with a Syſtem of Metamorphoſis infinitely more ſurprizing than thoſe of your *Ovid*, and of whoſe Reality, your Sight and Touch ſhall fully convince you.

Chev. That's the very thing I deſire.

Count. What would be your Surprize, ſhould I tell you, there is a certain Country where a Multitude of Animals in different Forms, are to be met with, ſome of whom live deep in the Earth itſelf, others in the Water, and who afterwards aſſume a new Figure, live upon the Surface of the Ground, and creep like Serpents through Woods and Fields; and after a certain Period, ceaſe to eat, and build themſelves Habitations, or rather, Monuments of Death, where they continue buried ſeveral Weeks, and ſometimes Months, and whole Years, without Motion or Action, and to all Appearance, without Life itſelf; and who, after all this, revive, in the Form of Birds, and break through the Incloſure of their Sepulchres, unfold a moſt beautiful Plumage to the Sun Beams; and with expanded Wings commence Inhabitants of the Air?

Chev. I ſhould be glad to know where this Country lyes, and what are the Names of thoſe Birds. But I find it very difficult to believe, that ——

Count. Nothing in Nature is more certain. The Country I am ſpeaking of is our own, and theſe Animals are the Inſects who are daily preſenting themſelves to our View.

Chev. How! are we we talking of Flies and Caterpillars; Waſps and Bees.

Count. The very ſame.

Chev. What Change do they undergo.

Count. Theſe and many other Inſects, when they come out of the Egg, are no more than little Worms, ſome without, and others with Feet. Thoſe who have none, are left to the Care of their Parents, who take upon them the Charge of lodging their Offspring in commodious Habitations, and furniſhing them with their neceſſary Aliment, or they even place them in the Center of the Subſtance that is to ſuſtain them. Thoſe who have Feet, look out for Nouriſhment themſelves, on the Leaves of a Tree, moſt ſuitable to them, and which proves to be the very ſame on which their Mothers have placed them. In a little Time they increaſe very ſenſibly in Bulk. Many of them caſt off their Attire, and aſſume a new Youth, in a Skin they change five or ſix Times. After this, all of them (remember I am ſpeaking of thoſe who undergo any Change) paſs through an intermediate State, called either the *Nymph*, or *Cryſalis*. Theſe are different Terms, that ſignify very near the ſame Thing, and of which 'tis neceſſary to give you the Explanation. The little Worm, in Proceſs of Time, ceaſes to feed; and incloſes itſelf in a Kind of ſmall Sepulchre, that varies according to the Nature of the Animal, but is built by each Species in an uniform Manner. And there, under a Foldage that preſerves the extreme Delicacy of its Texture from all Injury, it acquires a new Conception, and a ſecond Birth. 'Tis then called a *Nymph*, which ſignifies a young Bride, becauſe the Inſect in that Period puts on its beautiful Attire, and aſſumes the laſt Form, in which it is to multiply its Species by Generation. This Form is called the *Chryſalis*, or the *Aurelia*, or Golden Nymph, becauſe

Their intermediate State.

becauſe the little Film, whether hard or tender, with which it is inveſted, is by Degrees tinged with a very bright and glowing Colour. It likewiſe goes by the Name of the *Cone*, *Shell*, or *Bean*, becauſe 'tis then wrapp'd up in a Skin generally very hard, and like the Shell of an Egg, or the Coat of a Bean. But it muſt be granted, that the Term *Cone*, is moſt commonly uſed to ſignify thoſe little Balls of Thread and Glew, in which Silk-Worms, and ſome Caterpillars wrap themſelves when they become Nymphs.

Their laſt State.

In a Word: Their fourth and laſt State, the great and final Metamorphoſis which happens to them, is when they riſe out of their Tombs, and become flying Inſects; they then break thro' the Incloſure that ſurrounds them, and the Plumes which adorn their Heads begin to appear; they unfold their Wings, and — But let us defer the Wonders of their Reſurrection till to morrow. We muſt allow our good Friend the Chevalier, a little Time for Hunting.

Chev. No my Lord: Let me intreat you to proceed. Some of theſe *Aurelias*, in which Caterpillars intomb themſelves, have been often ſhewn me in the Form of Infants in Swadling Cloaths; but I thought they had been dead, and no body undeceiv'd me. You will give me a ſingular Pleaſure in acquainting me how this Change is accompliſhed.

Count. To-morrow we will enter upon the Particulars. In the mean Time, I am not a little pleaſed to find you reliſh our Metamorphoſes; but I would willingly give them a new Merit.

Chev. What may that be, my Lord?

Count. To make them deſirable. But let us reſerve them for another Converſation. I know you are uneaſy at this Delay, and believe me, Sir, I am charmed at your Impatience. There are very few of your Age, who would not be pleaſed at the Concluſion of ſuch a Conference as this.

The End of the firſt DIALOGUE.

CATERPILLARS.

DIALOGUE II.

The COUNT, *and* COUNTESS,
The PRIOR, *and*
The CHEVALIER.

Count. I Don't ſee any Body here. My Lady's Company is all withdrawn. Let us place ourſelves in this Arbour, and continue our Hiſtory of Inſects.

Prior. The *Chevalier* has been reading to me this Morning, a Summary of our Yeſterday's Converſation, which will pleaſe your Lordſhip exceedingly. He fully demonſtrates, that Corruption would be poſſeſs'd both of Wiſdom and Power, were it capable of forming an organized Body; he ſucceeds as well in the Reaſons he aſſigns for the Parents Choice of thoſe different Places where we find their Eggs; and has been as accurate in his Account of the various Changes the Generality of Inſects undergo.

Count. We muſt appoint the *Chevalier* our Secretary, I am perſuaded I ſhall find my Advantage in it; for whenever my Affairs oblige me to be abſent, I ſhall know, by his Means, all the Particulars of your Conferences.

Prior. Believe me, *Chevalier*, ſince you have already acquired a Habit of Thinking, and can expreſs the Thoughts of others with ſuch a Grace and Perſpicuity, you have gained a noble Point, and we intend to make you the *Fontenelle* of our Academy.

Count. Where did we break off Yeſterday ?

Chev. We were upon Inſects who change their Form to that of a Nymph, from whence your Lordſhip, by a new kind of a Reſurrection, or Metamorphoſis, converted them into another Set of living Animals. And now I ſhould be glad to know if they really die before this Tranſformation.

Count. May we not venture to ſhorten the Expreſſion and affirm, that the Inſect actually dies, after its Converſion into a Nymph? 'Tis a real Animal, furniſhed with Eyes and Feet, a Body and Inteſtines; in a word, with all the Members proper for it; and which are entirely different from the flying Animal who is to ſucceed it. It diveſts itſelf of its Head, its Eyes and Body, and is then in an evident State of Death. Take away the Head and Body from any other Animal, and you deprive it of every Thing eſſential to Life. The Deſtruction of the Parts, implies that of the Whole. Thus the Lion, the Horſe, and all other Creatures, ceaſe to live. But as for the Worm, the Caterpillar, and a Variety of other little Animals who are thought ſo deſpicable, their Death is the Original of a new Exiſtence; their End is the Commencement of another Order of Things. When a Worm is dead it produces a Fly; a Butterfly riſes from a Caterpillar; and Inſects that fly, proceed from thoſe that creep *.

'Tis true, the former Animal furniſhes an Incloſure to a living Embrio that reſides in it, and compleats its Form, after the Deſtruction of the preceding Inſect. 'Tis alſo granted, that 'tis poſſible to diſcern the laſt Animal under the Skin of its Predeceſſor, in which it lay involved. But ſtill the firſt is a real Animal, who dies to make room for the ſecond.

Prior. We muſt obſerve however, that the firſt Animal is no Stranger to the ſecond, but regards it as Part of itſelf, or rather, a ſecond Self, wherein it ſhall enjoy a Renovation. The indefatigable Care with which it builds a Repoſitory for the Spoils of the old Inſect, ſufficiently intimates its Expectation of ſomething better, and more exalted. 'Tis not at all intimidated with this Appearance of Death, which is no more than its Paſſage to a more amiable State;

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* Hiſtory of Inſects, by *Swamm.*

and, far from being diſmayed at the View of its Winding Sheet, it exiſts with Aſſiduity and Joy, in preparing it, exhauſts all its Strength and Subſtance to compleat it; and it may be ſaid to die like a Grain of Corn, whoſe conſtituent Parts are diſſipated under the Earth, in order to be nutrimental to the Bud that will ſpring from thoſe Remains.

Count. Let us quit all general Propoſitions, and deſcend to Particulars. There are ſome Inſects, whoſe only Food is the Herbage of Fields and Gardens. Others feed upon the Wood, into which they eat their Way. Some find a Subſiſtance even in Stones. Another Claſs can only live in Water, or other Liquors. And ſeveral Tribes feed upon the Subſtance of other Animals. As the Subject is therefore ſo extenſive, let us ſelect thoſe Species which are moſt familiar to us. The *Chevalier* is already acquainted with Silk Worms and Caterpillars, and we will begin with them.

Chev. I have been long deſirous of having a right Idea of the Matter they ſpin, and the particular Form of the Diſtaff they employ on that Occaſion: But I ſee the Counteſs behind the Arbour; let us advance and receive her.

Counteſs. Gentlemen, ſince your Converſation turns on Diſtaffs and Thread, I have ſome Privilege to be ſeated among you; and I ſhall now be glad to know the Subject you chuſe for your Entertainment.

Count. We were talking of Silk Worms and other Caterpillars whoſe different Species already known, amount to more than three hundred[†]; and every Day new ones are diſcovered. One Species entirely varies from another in Shape, Colour, Inclinations and Manner of Life: But in the ſame Species every thing is perfectly uniform. Let us firſt examine what they all have in common. They are all compoſed of ſeveral Rings like Silk Worms; and as they enlarge and contract the Diſtance between them, they move their Bodies wherever they have occaſion to transfer them. They have a certain Number of Feet which bend and play, by the Means of little Joints; and are armed with Claws,

Rings.

Feet.

[†] See *Godart*'s general Hiſtory of Inſects. *Aubriet*'s Collection.

Caterpillars.

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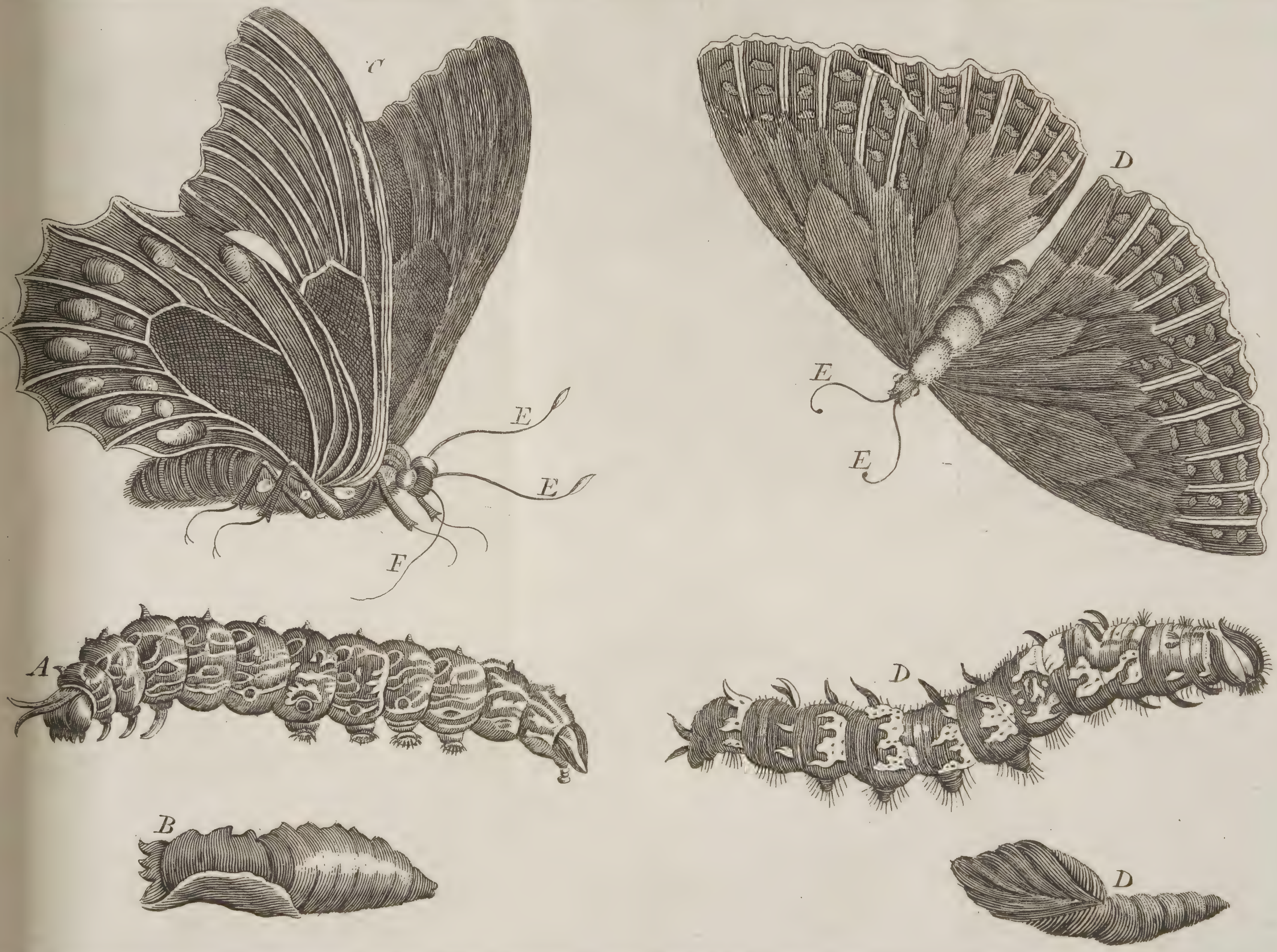

A. A. Caterpillar of Surinam. See the figure 17 of the Collection of Madam Maria Sibulla Marian. B. The Chrysalis of this Caterpillar. C. the Butterfly Sprung from the Chrysalis. D. Another Animal of the same Collection. E. the Antennæ or Horns. F. the Trunk for Suction.

to fix and rivet themſelves to the Bark of Trees, eſpecially while they ſleep. The Generality of them have a Thread, whoſe Subſtance is a liquid Gum; which they extract from the Leaves they eat. When they are apprehenſive of being carried away by any Bird, or cruſhed by the moving Branches, they ſhed a few Drops of this Gum upon the Tree; and then, precipitating themſelves, ſpin it in their Deſcent through ſeveral Orifices of their Bodies, that furniſh as many different Threads, which they bring together with their Claws; and as the Threads are moiſtened with a natural Glew, that unites them by a ſtrong Coheſion, they, by theſe Means, form one entire Thread, capable of ſuſtaining the Animal's Body in the Air †.

Thread.

Counteſs. Methinks I ſee one of our Ropemakers, who, after he has faſtened the End of his Work to the Wheel, retires from it backwards; and continually throws out ſeveral Twiſts of Hemp, which he mixes together, and joins with his Fingers; and out of them all makes but one Rope.

Prior. The Compariſon is very juſt; and the only little Difference I can obſerve in it, is, that the circular Motion, which is perpetually communicated by the Wheel, to all the Rope, is that which joins ſeveral Threads into one, under the Fingers of the Workman; whereas, in the Inſtance before us, 'tis a certain Glew which unites the ſeveral Threads, by the Aid of the Caterpillar's Claws.

Count. What ſurprizes me moſt, is, that a Fluid which ſeems, when the Caterpillar is cruſhed, to be very limpid, ſhould thicken into a Conſiſtence, and grow dry and tenacious, the Moment the Creature goes to work with it; in ſhort, that it ſhould immediately be uſeful to her as a ſtrong Chain, to keep her ſuſpended out of the Reach of Danger, and ſhould afterwards aſſiſt her, like a Ladder, to aſcend to her former Situation.

This is not the only Aſſiſtance Nature has granted to her extreme Imbecility; for ſhe is generally covered with Hair, which preſerves her from the rude Acceſs of Waters, in which ſhe would otherwiſe be drowned or frozen. The ſame Hair

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† *Lewenhoeck*, Arcan. Nat. Tom. iii.

Hair warns her to ſlide down from her Station, before the Branches, agitated by the Wind, can cruſh her; and when the Thread, by which ſhe hangs, is diſconcerted or broken, the Hair, with which ſhe is thick ſet, prevents her from being bruiſed in her Fall.

Colours.

Would you believe, *Chevalier*, that even the Colour of Caterpillars is one of the beſt Preſervatives many of them enjoy, againſt the Birds, who can find no Suſtenance ſo delicate and proper for their Young, as theſe Creatures*?

Chev. Does your Lordſhip mean thoſe little ſhining Specks with which their Backs are ſpangled?

Count. No: Theſe Specks rather contribute to diſtinguiſh them, eſpecially when they are ſeen near. What I mean, is, that almoſt all of them have one principal Colour, which perfectly reſembles that of the Leaves they feed on, or the little Branches where they fix themſelves, when they caſt their Skins. The Caterpillars who eat Buckthorn are altogether as green as that Plant. Thoſe who are nouriſhed with Elder, aſſume the Complexion of that Tree. You may obſerve on Dwarf and Apple Trees, Numbers of theſe Creatures, that are as much embrowned as the Wood of thoſe Plants. They are very careful to quit the Leaves and prudently retire along the Branches, when the time for caſting their Skins is come. By theſe Means they are confounded with the Matter that ſupports them, are rendered leſs viſible, and during their long Sleep, eſcape the Birds who are ſearching for them.

Chev. But to what Purpoſe then has Nature furniſhed Birds with a Bill to ſeize their Prey, if that Prey has a hundred Conveniencies for eſcaping?

Counteſs. Does not the *Prior*, find a Contradiction in this?

Prior. I confeſs, Madam, a ſeeming Contradiction appears, and indeed reigns through all Nature; but in Reality, 'tis the Effect of a Sagacity which is no leſs evident. This pretended Contradiction keeps all Nature in Exerciſe and Action. All the mute Creatures are either employed in Invaſions or Defence, and Nature has given Arms offenſive and defenſive, to each Individual. By theſe Means hey all find Animals enough to ſuſtain one another, and yet there is a ſufficient Number preſerved to perpetuate the Species. Each Family is ſuſtained, and every Table furniſhed to this Moment, and yet there is a large Overplus of Proviſions for many Days. Is there not a kind of Contradiction, in permitting Fiſhermen to catch Fiſh, and, at the ſame time, obliging them to uſe Nets with large Meſhes, thro' which not only the Fry, but even Fiſh of a conſiderable Size eſcape? And yet this is no more than a juſt Precaution taken by a wiſe Government, which at once provides for preſent Neceſſity and future Want. Nature has accommodated all Animals with Nets, and permitted them to fiſh and ſuſtain themſelves; but then ſhe has prudently limited the Dimenſions of the Meſhes. Vaſt Quantities of Fiſh are daily caught, but there are always more preſerved than taken, whether they eſcape through the Meſhes, or elſe happen not to be invaded.

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* *Derham,* Theol. Phyſ. l. 4. c. 14.

Counteſs. Chevalier, we are not the beſt Managers of a Contradiction: When you ſtart a Hare, and ſhe employs all her Subtlety to eſcape your Dogs, do you find any Contradiction there?

Chev. None at all. On the contrary, nothing is more natural or better deſigned. If Hares did not defend themſelves, our Dogs would have no Employment.

Count. What you obſerve in the Hare and Dog, you may pronounce of other Animals, and even Inſects themſelves. Nature, by enabling ſome to attack and ſeize, has not left the others defenceleſs: The leaſt have their Preſervatives. You ſee, that even ſuch feeble Inſects as Caterpillars, are not unprovided with the Means of their Security, and to theſe they add their little Policies and wiſe Precautions. For Inſtance; you will oftner find them under, than upon the Leaves they eat; the Reaſon is, that they may not be diſcovered by the Birds. Oftentimes they do that before a Bird, which a Mouſe practiſes in the Sight of a Cat; they counterfeit Death, to amuſe their Enemy. And when, by this Stratagem, they have made him negligent, they improve the favourable Moment, and conceal themſelves.

Prior. I have ſeen * others extended in a motionleſs Poſture, and counterfeiting Sleep; upon which a Number of little winged Vermin, that were flying about at a ſmall Diſtance, have immediately faſten'd upon them, as a ſure Prey. The Caterpillars, for ſome time, let them run over their Backs, and then ſuddenly turning their Heads, ſeized their Enemies, and regaled themſelves with their Fleſh.

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* Godart.

Chev. How, Sir, are they Fleſh-Eaters too?

Their Food.

Count. This Species, which the Prior mentions, inſtead of being a Caterpillar, is rather a carniverous Worm, that feeds on theſe Vermin. All Inſects have a Method, and a Food peculiar to them, and from which they never vary. Caterpillars, for Inſtance, are not only limited to Herbage, but likewiſe to a particular Species of it; each Claſs of theſe Creatures has been enjoined to content itſelf with one particular Plant, and they are ſo ſtrict in their Obedience to this Command, that they will ſooner periſh with Hunger than touch any other Plant; unleſs they meet with one whoſe Qualities correſpond with their ordinary Food. However, we muſt except from this Rule, ſome particular Species, who are leſs preciſe in this Point, and can accommodate themſelves to any thing.

Chev. Is there not ſome Inconvenience, my Lord, in this Regulation? Suppoſe a Plant, aſſigned to one certain Species of Caterpillars, ſhould happen to fail, that Claſs of Inſects would be extinct too. Why ſhould they be confined then to ſuch narrow Bounds?

Counteſs. You criticiſe upon Nature, Sir, where you certainly ought to thank her. If our Apple Trees, that at preſent have only a few Species of Caterpillars for their Enemies, were given up to the Ravages of two or three hundred, judge how our Deſerts would ſuffer? It was therefore wiſely ordained, that Caterpillars ſhould only be deſtructive within certain Bounds.

Their Uſe.

Chev. I am ſenſible that I had no Reaſon for my Complaint, ſince we find our Advantage in this Limitation. I ſhould rather have aſked, why ſome Species often multiply to ſuch a Degree, as to carry Deſtruction with them wherever they go? It is not many Years ſince that Species which love the Apple-Tree, did not ſpare ſo much as one Leaf.] Thoſe Trees were all loaden with Fruit, which immediately withered away, and periſhed." What therefore may the Uſe of Caterpillars be in general? In my Opinion we might do very well without them.

Prior. They are very far from being uſeleſs: Deſtroy Caterpillars and Worms, and you ſtarve the Birds, for thoſe we eat, as well as thoſe who entertain us with their Songs, have no other Suſtenance in their Infancy. 'Tis then they addreſs their Cries to the great Creator, and he multiplies Food for them, accommodated to the exceeding Delicacy of their Texture. In a Word, 'tis for them that he every where diſperſes Worms and Caterpillars. Pſalm cxlvi. 9.

Count. The little Birds in Reality, don't forſake their Eggs, till the Fields are replenished with Caterpillars; and theſe diſappear, when the Young, grown ſtronger, have Occaſion for another Sort of Nouriſhment, or can live without the Food they were firſt accuſtomed to. Before the Month of *April* there are no Caterpillars, nor Broods of Birds. In the Month of *Auguſt*, or *September*, there are neither Broods nor Caterpillars; the Earth is then covered with Grain, and other Proviſions of every Kind. Their Duration.

Prior. Till that Time the Birds have Caterpillars aſſigned them for their Support, and 'tis but juſt that theſe ſhould likewiſe be furniſhed with proper Food, and this they are ſupplied with from the Plants. They have a Right as well as ourſelves, to the Verdure of the Earth: They have a certain Title, founded in the Permiſſion God originally gave to every Creature who lives and creeps upon the Earth, of receiving its Nouriſhment from the Plants; and their Charter is as authentick as ours, ſince it is preciſely the very ſame. Gen. i. 29, 30.

The Participation of the Herbs and Fruits of the Earth, which Inſects are permitted to enjoy in common with Man, is ſometimes very prejudicial to him; and, as ſuch, was both foreſeen and ordained. Man wants to be inſtructed, as well as ſuſtained. His Ingratitude is confounded, when theſe Inſects deprive him of what God had diſplay'd to his View with ſo much Liberality; and his Pride is no leſs humbled, when the Lord commands his avenging Armies to march forth, and, inſtead of Lions and Tygers, or other formidable Animals, ſets Caterpillars, Flies, and Locuſts, in array againſt him. Such inconſiderable Inſtruments as Worms and Flies, are employed by the Almighty, to humble the Pride of Men, who are too apt to flatter themſelves, that they are rich, and great, and independent. You ſee, my dear *Chevalier*, that the ſame Hand which created the Fly and the Caterpillar, has alſo formed the Lion and the Tyger. He has prepared a convenient Nouriſhment for them all, becauſe he knows the particular Uſes for which he has reſerved them. *Every thing he has made is good in its Seaſon*; and when our weak Apprehenſions cannot penetrate into the Motives of his Works, ſhould we, for that Reaſon, preſume to diminiſh from them, or wiſh any Addition to them? But you will tell me I am preaching, and therefore we will return to our Hiſtory of Caterpillars, and beg the Favour of the *Count*, to give us a View of theſe Creatures, as they are employ'd in building their Tombs.

Eccleſ. iii. 2.

Counteſs. I find you don't expect much from me, and ſo I am not aſked any Queſtions. However, I would willingly be of ſome Conſequence in my Turn; and deſire Leave to ſend my Servant up to my Cloſet for a little Box, that will ſpeak for me, as well as a fine Oration. You will find in it what will entertain your Eyes at leaſt; in the mean Time, let us take a View of the Caterpillars Funeral.

Their Tombs.

Count. Towards the End of Summer, and ſometimes ſooner, theſe Inſects, when they are ſatiated with Verdure, and have changed their Skin ſeveral Times, ceaſe to eat, and employ themſelves in building a Retreat, wherein they are to quit the Life and Form of a Caterpillar, to give Birth to the Butterfly they contain within them. A few Days are ſufficient to conduct ſome into a new State of Exiſtence. Others continue whole Months and Years in their Sepulchres. There are ſome Species that plunge themſelves to a ſmall Depth in the Earth, after they are ſatiated with their Food. In that Situation they begin their Efforts, and rend their Robe, which, with the Head, the Paws, and Entrails, ſhrink back like a Skin of dry Parchment; and there remains a Subſtance that reſembles a Bean, or a Kind of Covering of a brown Complexion, with an oval Form, the moſt pointed Part of which terminates in ſeveral moving Rings, whoſe Dimenſions are gradually diminiſh'd. This is the Chryſalis, that incloſes the Embryo of the Butterfly, with ſuch Fluids as are proper to nouriſh, and compleat its Growth. When the Creature has acquired its perfect Form, and is invited by a genial Warmth, to quit the Scene of its Confinement, it burſts the large Extremity of its Incloſure, which always correſponds with its Head, and is weak enough to be opened at the firſt Effort.

Some Caterpillars, inſtead of ſinking themſelves into the Earth, prepare a Lodgment under the Projections of Roofs, in the Cavities of Walls; under the Bark of Trees, and even in the Heart of the Wood. All of them have ſufficient Abilities to ſecure themſelves a ſafe Retreat, for the Time they are to continue in the Form of Aurelias.

There are others who ſuſpend themſelves, with great Dexterity, to the Roofs of Houſes, or the firſt Stake that occurs in their Way, and they proceed in the following Manner. The Caterpillar extracts from her own Subſtance a glutinous Fluid, which lengthens, and acquires a due Conſiſtency, in proportion as ſhe advances her Head from one Place to another: And when ſhe has glewed and interlaced ſeveral Threads on ſome ſmooth Place, to which ſhe intends to fix herſelf, ſhe inſinuates her hinder Paws into a Complication of the Tiſſue, by Means of the minute Claws in which they terminate. In this Manner ſhe accompliſhes her firſt Faſtening; after which ſhe rears her Head, and fixes a new Thread on the lateral Wood that correſponds with her fifth Ring, and then with a gentle Deflection of her Head, ſhe draws this Thread, in the Form of a Bow, around her Back, and then faſtens it to the oppoſite Side. She frequently repeats theſe Motions, in order to conduct the Thread from the Left to the Right, and from the Right to the Left. When this ſecond Band, which ſuſtains the Animal above the Middle of her Body, has been ſufficiently doubled and fortified, ſhe reſts upon it, and then agitates her Body, till it is intirely covered with Sweat. She then burſts her Skin, which gradually ſhrinks to the Side where her Paws are implicated in the Wood. Thoſe Paws are likewiſe diſſipated like the reſt of her Spoils; but all this is not ſufficient to diſengage the Chryſalis, becauſe, inſtead of the Paws, by which it was detained, the Extremity of the Bean has ſhot out a Set of little Points, whoſe Heads terminate like that of a Muſhroom, or Nail; and as they are extended beyond the Threads, they are ſufficient, with the Band that traverſes the Back, to faſten the Bean, till the proper Seaſon, when the Papilio is to be diſcharged from her Confinement.

I have been told that ſome Caterpillars involve their Bodies in a Texture of Thread and Glew, and then roll themſelves over a Bed of Sand, by which Means they collect an Incruſtration of ſmall Grains, and build themſelves in this Manner, a Monument of Stone. I have ſeen this Operation performed by other Inſects.

There are others who build in Wood, and crumble into ſmall Particles the Subſtance of a Willow, or ſome other Plant to which they have habituated themſelves. They afterwards pulverize the whole, and form it, with an intermixture of Glew, into a Paſte, in which they wrap themſelves up. This Compoſition dries over the Chryſalis it ſurrounds, and which aſſumes much the ſame Figure; ſo that it reſembles a Mummy, which correſponds with the Form of the Body it incloſes, and to which it ſerves as a Defence. I have ſome Inſects, in this Form of the Chryſalis, about me, and fancy the *Chevalier* will be pleaſed with the Sight.

Chev. They are really very entertaining Figures, and one would be apt to take them for Pagods, or Infants in Swadling Cloaths. Is it poſſible there ſhould be any Life within; and is a Butterfly to ſpring out of the Ruin? The whole Maſs ſeems to be quite dead.

Count. If you preſs them a little, you will find ſome Signs of Life. I could not give you a better Idea of their State of *Aurelias*, or *Nymphs*, than by letting you ſee theſe little Tombs, out of which as many Butterflies are to riſe. Thoſe who are Females will lay their Eggs, either upon the very Plant that formerly nouriſhed them, or upon one of the ſame Sort. They range their Eggs ſometimes in a ſtrait, or elſe in a circular Situation: Sometimes they wind them in a ſpiral Line, round a ſmall Branch, and always faſten them with ſuch a binding

Glew, that the Heavieſt Rains can't waſh them away.

You will find ſome Caterpillars, who, in their Works, neither imitate the Maſon nor Carpenter; but artificially ſpin themſelves a warm Robe to ſecure themſelves from the Rain. We ſhall give you a clearer Conception of this curious Work, when we come to deſcribe the Cones of Silk-Worms; to which they bear a perfect Reſemblance.

The Caterpillars we are moſt acquainted with are found in great Numbers upon Elms, Apple-Trees, and Buſhes. The Papilio that proceeds from theſe, chuſes ſome beautiful Leaf, on which ſhe fixes her Eggs in Autumn, and ſoon after dies, glewed and extended upon her beloved Family. The Sun, whoſe Rays have ſtill ſome Power, warms her Eggs, out of which, before the Winter Seaſon, a Multitude of little Caterpillars ſpring, who without having ever ſeen their Mother, and without the leaſt Model or Inſtructions, immediately, with a Kind of Emulation, betake themſelves to Spinning, and with their Threads induſtriouſly weave themſelves Beds, and a ſpacious Habitation; where they ſhelter themſelves from the Severity of the Seaſon, diſtributed into different Apartments, without eating, and frequently without ſtirring abroad. There is only one little opening at the Bottom of this Manſion, through which the Family ſometimes take the Air towards Noon, in a fine Sun-ſhine, and ſometimes in the Night, when the Weather is ſettled. When you would open their Retreat, you muſt employ a little Strength to break the Tiſſue that forms it, which is generally as firm as Parchment, and not to be penetrated by Rain, Wind, or Cold. There you find the whole Family repoſing on a ſoft and thick Down, and ſurrounded with ſeveral Folds of the Web they have ſpun, which at once ſupplies them with their Quilts, their Curtains, and their Tent.

Chev. 'Tis extremely ſurprizing to ſee ſuch tender Animals paſs the Winter in this Manner; but it amazes me yet more, that they ſhould live all that Seaſon without eating.

Count. There are various Species of Birds, Reptiles and Inſects, who ſleep ſeveral Months in this Manner; and as they ſuffer no Diſſipation of their Animal Spirits, ſo they want no Recruits of Food.

Counteſs. There is an odd Peculiarity among Caterpillars, An Objection againſt the regular Generation of Caterpillars.

lars, and I am very deſirous of having it cleared up. In order to make a fine Collection of Papilio's, I have frequently procured, and nouriſhed the Caterpillars that produce them; but inſtead of obtaining a Birth of Papilio's from them, they have frequently diſappointed me with a Race of Flies.

Prior. This I have often obſerved, myſelf. One ſhall ſee, for Inſtance, a ſwarm of little Flies marching out of a living Caterpillar, thro' the Apertures they have pierced in her Skin. We ſometimes obſerve * ſeveral Worms proceeding from that Animal; after which they enfold themſelves in a Covering of Thread, and ſeem in a ſhort Time to be changed into Flies. I have even ſeen Flies extremely ſmall, iſſue from the Eggs of Papilio's.

Chev. If one Species is thus changed into another, the Generation of Inſects can never be regular and uniform.

Count. Theſe Flies are not the Offspring of the Caterpillar, who never engender'd any Animal whatever; and it is impoſſible they ſhould be the Progeny of the Papilio, who can produce nothing but the Eggs of Papilio's. The Microſcope has enabled me to unravel this Myſtery, and I have diſcovered, by its Aſſiſtance, two Apertures in the Eggs of thoſe Papilio's, from whom the little Flies ſpring: One of them is very large, and it affords the Fly a Paſſage out of the Egg: The other is extremely ſmall, and the Fly paſſed into the Eggs through this, in the Form of a Worm, which proceeds from the Egg of a Fly. This Worm penetrates the Egg of the Papilio, in order to ſettle there; and when this is accompliſhed, it throws away the ſpoils of a Worm; and then the little Chryſalis, which lay involved in thoſe Spoils, produces the ſmall Fly that iſſues from the Egg.

There are ſeveral Species of Flies who faſten on the Body of a Caterpillar, and depoſit their Eggs in the Punctures they have made in that Animal; in Conſequence of which, thoſe Eggs are productive of Worms, Aurelias, and Flies. A Variety of Miſtakes, with Relation to the Origin of Inſects, have been occaſioned, for want of knowing the Method Flies take, to depoſit their Eggs in ſuch

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* Valliſneri, *Tom*. i. *Edit*. *Fol*.

Places as can beſt afford a convenient Food for the Young that are afterwards to proceed from them.

Prior. I lately ſaw a large Fly pierce the Skin of one of thoſe Caterpillars * that feeds on the Leaves of Elms; and from that Puncture proceeded one of thoſe Flies that gave Battle to the Garden Spider. I wiſh we had the two Champions here, to entertain the *Chevalier* with their Combat. The Fly, at the firſt Encounter, darts with all its Force upon its Enemy, who lies in Ambuſh in the Center of the Web. The Spider immediately falls from its Situation, ſtunn'd with the Shock; but in his Deſcent, always ſpins his Way down. The Fly takes Advantage of his Adverſary's Diſorder, ſprings from his Body, and after he has dragged him to the Earth, breaks all his Legs; he then wheels very fiercely round the Spider, either to ſeize him in ſome Part where he can have no Apprehenſion of his Claws, or elſe to teſtify his Joy at his Victory over the Enemy of his Species: And after he has thus marched round him, two or three Times, he faſtens upon him, and immediately mounts into the Air with his Captive.

Chev. This Creature is the very *Achilles* of the Flies, and that Hero treated the unfortunate *Hector* exactly in this Manner; for, after he had overthrown him in the Duſt, he diſarmed him, and, when he had offered him a thouſand Inſults, dragged him to his Tent.

Count. If you have any Inclination to be acquainted with the other Tribes of theſe Creatures, their Inclinations, and various Properties, you may, while you continue in the Country, make a Collection of all their Species in little Boxes; but you muſt remember to ſupply them every Day with green Proviſions, ſuitable to their ſeveral Natures; and, when you have done this, you cannot imagine what an agreeable Amuſement you will receive from the Variety and Exactneſs of their Operations.

Counteſs. For my Part, I think the *Chevalier* is already very attentive to the Cones, that are neareſt their Change, and ſeems to wait with Impatience for the Reſurrection that is to enſue.

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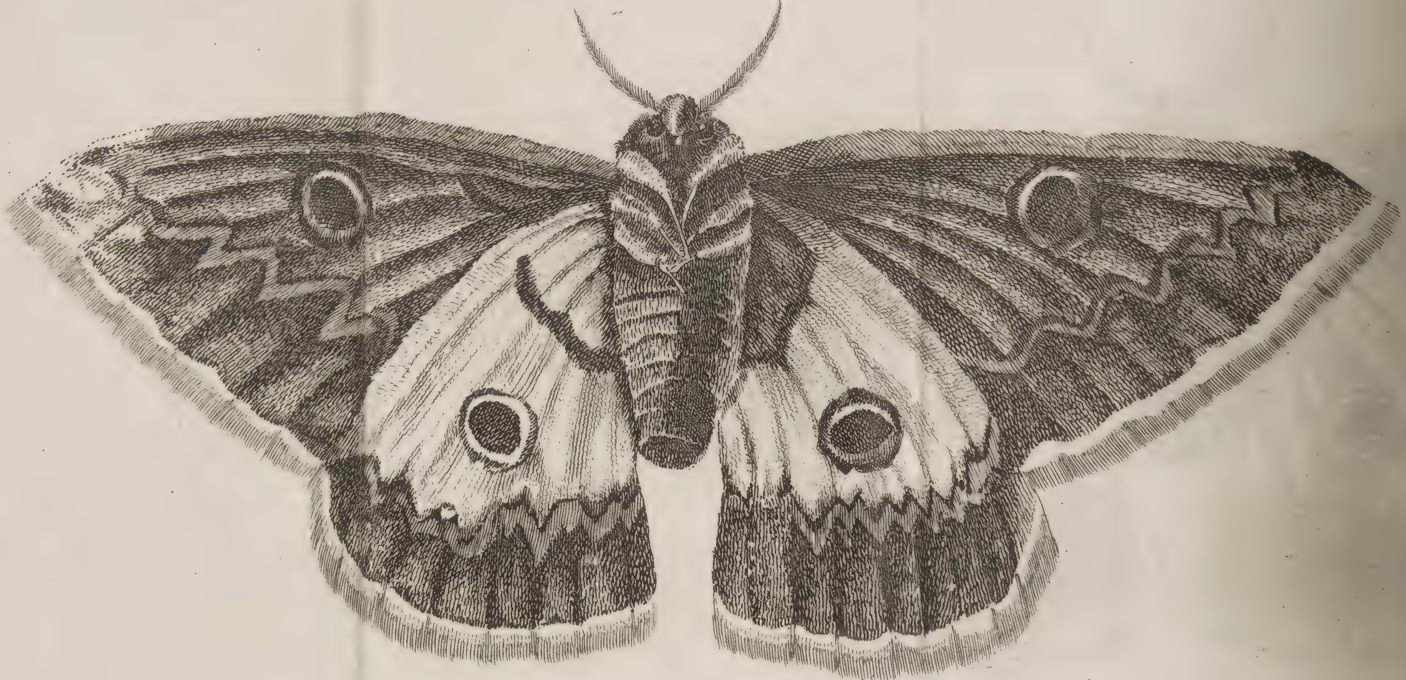
* Godart, *Exper.* liii.

The Metamorphoſis.

Prior. How is it poſſible to be unaffected with this little Miracle of Nature! Open one of theſe Aurelia's, and it will ſeem to preſent you with nothing but a Kind of Putrefaction, in which every thing is confounded; but then, this Putrefaction contains the Elements of a better State of Exiſtence, and compoſes the nutrimental Juices which contribute to the Growth of a more perfect Animal. The Time for its Enlargement, at laſt arrives, and the Creature then forces its Way through the Priſon that contained it. The Head diſengages itſelf through the Aperture, the Horns lengthen, the Legs and Wings are extended, and at laſt, the Butterfly takes its Flight through the Air, and retains no Similitude of its former Condition. The Caterpillar, who is changed into a Nymph, and the Butterfly that proceeds from it, are two Animals entirely different. The firſt was altogether terreſtrial, and crawled heavily along the Ground. The ſecond is Agility itſelf, and is ſo far from limiting its Motions to the Earth, that it, in ſome meaſure, diſdains to repoſe on its Lap. The firſt was all ſhaggy, and frequently of an hideous Aſpect. The other is array'd in Colours of the moſt beautiful Glow. The former ſtupidly confines itſelf to a groſs Food; whereas this ranges from Flower to Flower, regales itſelf with Honey and Dews, and perpetually varies its Pleaſure. This new Animal enjoys all Nature in full Liberty, and is itſelf one of her amiable Embelliſhments.

Counteſs. The *Prior* has given us a very agreeable Image of our own Reſurrection.

Prior. All Nature abounds with ſenſible Images of celeſtial Things, and the ſublimeſt Truths; and a real Profit perpetually redounds from the Contemplation of her Works. This is a Theology that is conſtantly well received, becauſe it is always intelligible. The greateſt of all Maſters, or rather our only Maſter, has taught us this Method, by taking the chief Part of his Inſtructions from the moſt common Objects Nature preſented to his View; and in particular, he has given us an Image of the Reſurrection, in a Grain of Wheat, that continues unmultiplied till it dies; but as ſoon as it is rotten in the Earth, produces a large Profuſion of Grain.

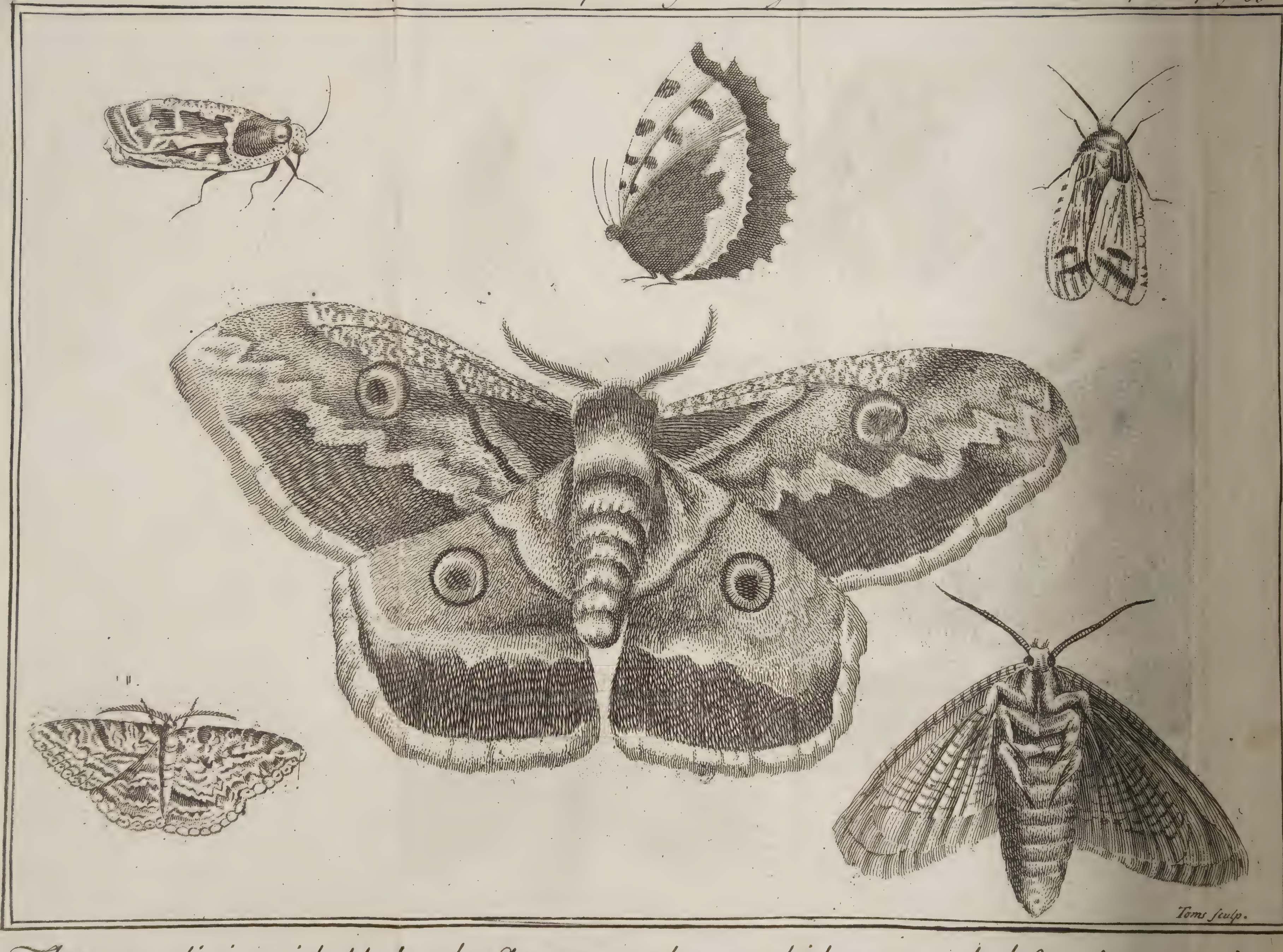


Toms sculp.

The Under View of the Papilio's Plumage.

The Papilios of the Night

Plate 4 Vol. I page 35



They are distinguishable by the Antennæ or horns which constantly leſsen into a point

Counteſs. If the Study of thoſe Changes which Inſects undergo, could afford us no more than one uſeful Compariſon, our Time, even in that Caſe, would not be miſemployed. But my Servant has brought us the Box I was deſirous the *Chevalier* ſhould ſee: Here is the Key, Sir; be pleaſed to open it, and divert yourſelf.

Chev. Are they Caterpillars who are at work in it?

Butterflies.

Counteſs. No: They are Creatures riſen from the Graves of thoſe Inſects, though their Reſurrection has not added Immortality to their new Life. I have collected and paſted here, in different Compartments, all the ſeveral Kinds of Papilio's I have ever ſeen; and as I learned to paint when I was very young, I have copied each Animal from Nature, under every Compartment, and have likewiſe repreſented the Caterpillar and Aurelia, that are proper to each Species, in their natural Colours and Dimenſions. Examine the firſt Compartment you caſt your Eyes on.

Chev. What delightful Colouring is here! Pray let us obſerve them in order, and begin with the firſt.

Moths.

Counteſs. The Papilio's, who make their Appearance in the Night, I have ranged upon a Ground of white Sattin. Their Shades and Colours are ſoft and agreeable, but not very ſhining; and they want to be heightened with white, to give them a better Effect. As all theſe Inſects only appear in the Night, I call them my *Owl-Papilio's*. You ſee them painted under the Compartment, in the ſame Order. Thoſe of the firſt Range repreſent Moths that gnaw Stuffs.

Chev. They ſeem to be wrapp'd up in a Kind of Muff, out of which they extend their Heads and Bodies.

Counteſs. That Muff* is a Habitation which they themſelves prepare. The young One, upon leaving the Egg, which a Butterfly has lodg'd upon a Piece of Stuff, or a Skin well dreſſed, and commodious for her Purpoſe, immediately finds a Habitation, and Food in the Nap of the Stuff, or Hair of the Skin. It gnaws † and lives upon the Nap, and likewiſe builds with it the Apartment you ſee, accommodated both with a Fore-door, and a Back-one. The whole is well faſtened to the Ground of the Stuff, with ſeveral Strings and a little Glew. The Moth ſometimes thruſts her Head out of one Opening, and ſometimes out of the other, and perpetually devours, and demoliſhes all about her. But 'tis very pleaſant to obſerve, that the Tent of this Creature is always of the ſame Colour with the Subſtance ſhe feeds upon; and when ſhe has cleared the Place about her, ſhe draws out all the Stakes of this Tent; after which ſhe carries it to ſome little Diſtance on her Back, and then fixes it with her ſlender Cords in a new Situation. If ſhe has been gnawing red Wool, and ſhould afterwards find herſelf placed on a Parcel of Wool of a green Dye, her Habitation, which, till then, was all red, is enlarged in its Dimenſions, but, at the ſame Time, becomes tinged with Green, and perfectly correſponds with the Plain where ſhe finds her Paſture. In this Manner ſhe continues to live at our Expence, till ſhe is ſatiated with her Food, at which Period ſhe is firſt transformed into a Nymph, and then changes to a Papilio. I would not have the *Chevalier* believe all this to be only an agreeable Amuſement. For my part, I was willing, as a good Oeconomiſt, to have ſome Knowledge of an Animal ſo deſtructive to our Furniture; and this Knowledge has likewiſe furniſh'd me with a Remedy, which is obtained, by frequently rubbing the Tapeſtry and Curtains with a Lock of Sheep's Wool, that ſtill retains its natural Fat. This Diſcovery was made by obſerving, that the Moth always chuſes Skins and Wool, that have been manufactur'd by the Workman. Another Remedy is, to beat our Stuffs and Tapeſtries well, before the Papilio's have laid their Eggs, towards the Middle of the Summer; and to be careful not to replace them in the Apartments, till you have deſtroyed the Moths and Papilio's with Oil of Turpentine, or the Smoke of Tobacco.

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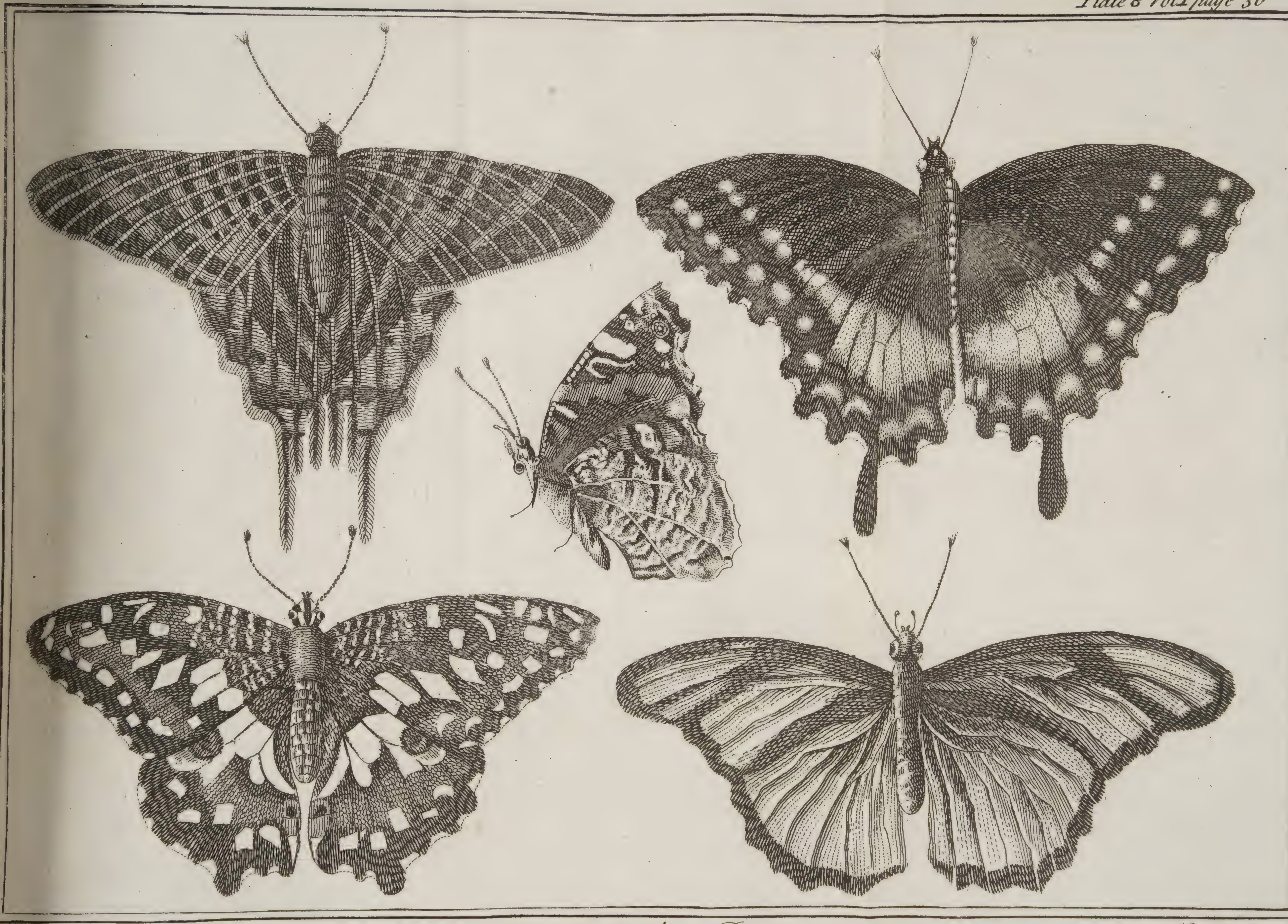
* Memoirs of the Academy of Sciences, 1728.

† Monſ. Reaumur.

Let us now proceed to the ſecond Compartment, which begins with thoſe Papilio's that appear in the Day. Their Size is generally larger, and their Colours more lively. I always took Care to fix them on a Sattin Ground, of a Colour contrary to that which appears in theſe Inſects. In this, and the next Compartment, you ſee no Colours but what are ſimple and uniform; but in the fourth, you may

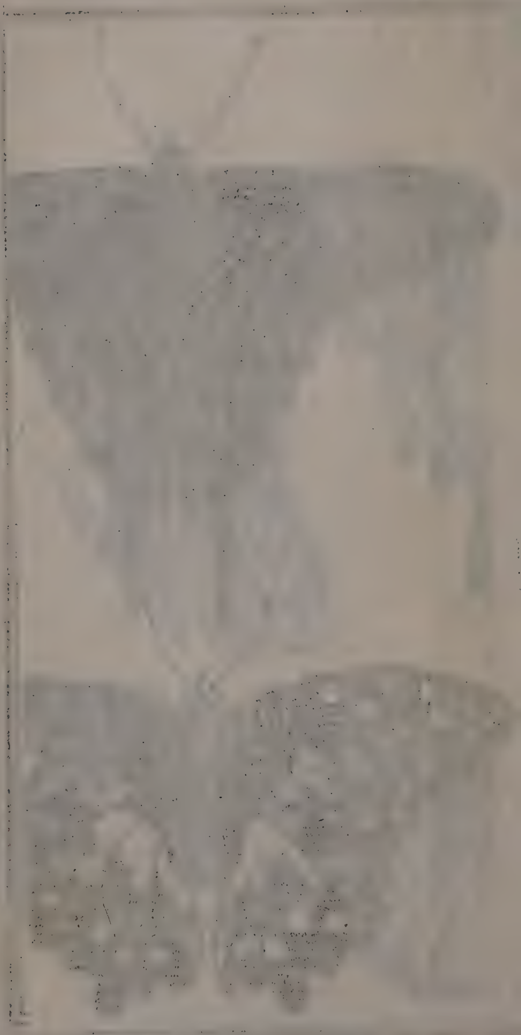
Plate 8 Vol I page 36



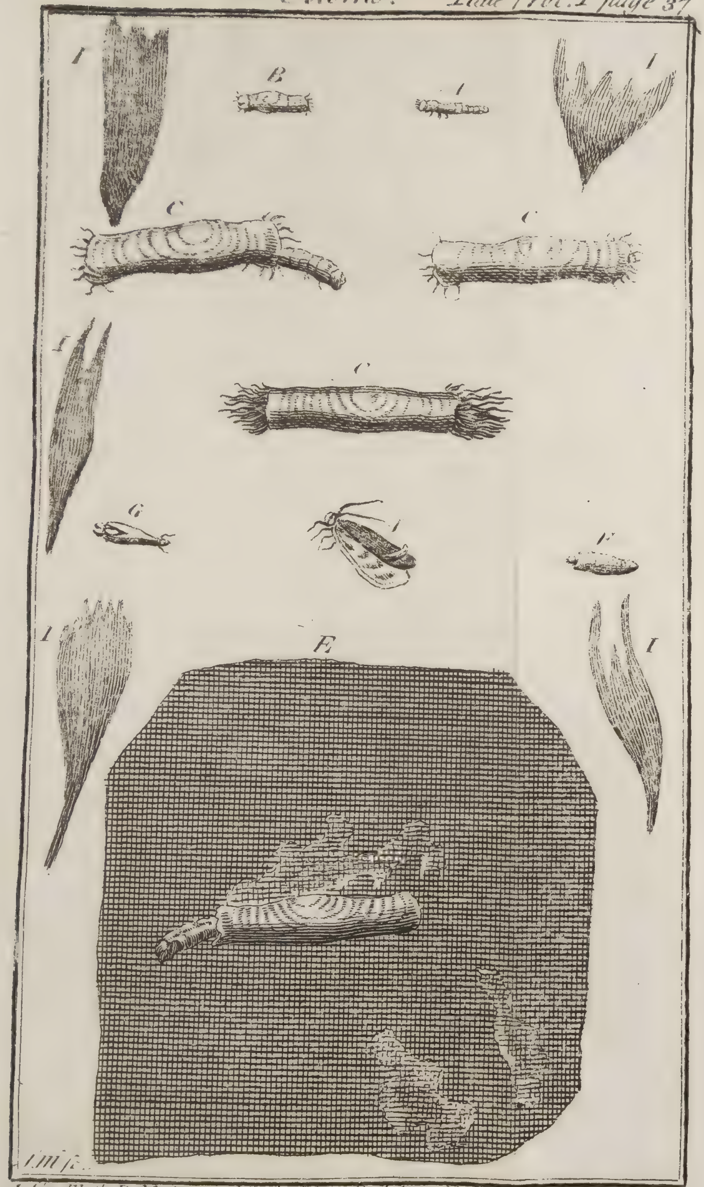
Toms ſculp.

Papilios of the Day.

Diſtinguiſhable by their Horns or Antennæ whoſe Extremities are formed into a kind of Tuff.



Moths. Plate 7 Vol. I page 37



A. The Moth. B. Veſture of ye Moth. C. The Moth & its Veſture larger than ye Life. D. The Faſtenings. E. Stuff gnawed by a Moth. F. The Chryſalis. G. The ſame view'd from beneath. H. The Butterfly ſprung from this Chryſalis. I. The Plumes of all ſorts of Butterflies as ſeen thro' a Microſcope.

may obſerve them intermingled with one another. I have there oppoſed white to red, and yellow to blue; all theſe Colours heighten, and contraſt each other, according to their different Degrees.

In the laſt Compartments, I have collected and ranged, with the niceſt Judgment and Propriety I was capable of, all thoſe Papilio's who are covered with Plumage, or tinctured with a Variety of Colours. You may there ſee thoſe of *French*, *Indian*, and *American* Extraction; for they have been brought to me from all Parts: Each Country has its own Species, ſhaped in a peculiar Manner. There is not one of theſe Creatures that has not a good Effect, when the Eye compares it with the next; and indeed moſt of them viewed ſingly, and independent of the reſt, give Pleaſure to the Sight; ſometimes by the rude, and ſometimes by the ſoft Gradation of one Colour into another, and the various Diminutions of the Tints; but, above all, one is aſtoniſhed at the Beauty of the largeſt of theſe Inſects, where Nature ſeems to ſport herſelf in the artificial Mixture and Diſplay of all her moſt amiable and radiant Treaſures. You will find, in theſe Wings, the Luſtre and Variety of all the Colours of Mother of Pearl, you will ſee the Eyes that ſparkle in a Peacock's Tail, and will find all the Edges bordered with the Ornaments of ſhining Silks, and Furbelows, the blending Dyes of *Hungary* Point, and the Magnificence of rich Fringes. When I have any Furniture, or Dreſs to adjuſt, 'tis here I come for Counſel. *Chevalier*, you may take a full View of them, if you pleaſe; I only deſire you not to preſs them with your Fingers, leſt you rub off the Feathers.

Chev. Feathers, Madam! I ſhould imagine that what a Butterfly diſcolours us with, could be nothing but Duſt. Whenever I have caught any of them, my Fingers were covered with a fine Powder, of the ſame Colour with the Creature.

Counteſs. That Powder *, as theſe Gentlemen have ſhewn me, is a Cluſter of little Feathers ending, at one Extremity, in a Quill, and, on the other, rounded and adorned with Fringe; the Extremity of one covers the Beginning of another. They are fixed in perfect Order, like the Feathers of Birds, and when you wipe them off, the Wing that remains is only a fine tranſparent Film, where you may diſcover the Sockets in which the Quill of each Feather was ſunk. But that you may have no farther Doubt of this Matter, caſt your Eyes upon the laſt Compartment, where I have ſcattered upon a Lay of Glew, the Duſt of all Sorts of Butterflies.

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* *Leuwenhoek*'s Arcan. Nat. p. 3. Epiſt. 146.

Count. Here's a Microſcope, Sir, that will enable you to change this Duſt into Feathers.

Chev. Nothing can be more certain than what the Lady has been declaring. Inſtead of diſcovering the leaſt Grain of Powder, I ſee nothing but beautiful Plumes, whoſe Colours have a Livelineſs, and Variety that enchant me.

Counteſs. Since you are not diſpleaſed, Sir, with my Amuſements, I will entertain you to morrow with my Silk-Worms. It will give you a real Pleaſure to ſee all the Labourers at work, eſpecially when they are forming their Thread; but unhappily for us, the Time for this Sight is elapſed, and you muſt defer your Viſit till the next Summer, when, I hope, you will favour us with your Company three Months, inſtead of one.

The End of the ſecond DIALOGUE.

SILK-

SILK-WORMS.

DIALOGUE III.

The COUNTESS,
The PRIOR, *and*
The CHEVALIER.

Counteſs. THE *Count* has taken a little Journey for two or three Days; but for all that we may proceed in our Conferences. Silk-Worms are to be our Speculation To-day; and we can enter upon this Subject without any Aſſiſtance from Books or Learning. I have brought up ſo many of thoſe Creatures from my Infancy, that I am able to entertain you with their Labours, and the Preſent we receive from them; but 'tis poſſible the *Chevalier* may be as well acquainted with them as myſelf.

Chev. I have ſometimes heard People ſpeak of them, and ſeveral of my Friends breed them up in Boxes; but I was never ſuffered to have any myſelf, and was even debarred from ſeeing thoſe that belong to others; ſo that one would have imagined theſe little Animals had been infectious.

Counteſs. Thoſe were Prejudices indeed. For my part, I have had Silk-Worms all my Life-time; though for ſome Years paſt, I have reſigned this Amuſement to my Daughters: They feed them, keep them clean, and equally ſhare them; they are entirely pleaſed with this Employment, and never find the leaſt Inconvenience in it, becauſe the Inſect is very agreeable; and whenever it grows ſick, they throw it away.

Chev. I ſhould take it as a very great Favour, Madam, if you would acquaint me how thoſe, who are to be brought up, muſt be managed; and in what manner you make uſe of their Labours.

Counteſs. There are two Methods of Rearing them: You may let them thrive and expiate in full Liberty upon the Trees that nouriſh them: Or you may keep them at Home, in a Place particularly accommodated to that Purpoſe, taking care to ſupply them every Day with freſh Leaves. The Prior has made an Experiment of the firſt Method; and I will deſire him to give us his Opinion of it.

Prior. 'Tis true: I had, ſome Years ago, the Curioſity to make this Uſe of the Mulberry-trees that grow under my Chamber Windows; and I lodged upon them a Number of Silk-Worms, who ſucceeded very well without my interfering in the leaſt. They practiſe the ſame in *China*, *Tunquin*, and other-hot Countries. The Butterflies, who ſpring from Worms, or rather Caterpillars, who ſpin Silk, chuſe a proper Part of the Mulberry-tree to depoſit their Eggs upon; and there they faſten them, with that Sort of Glew which moſt Inſects are provided with, for different Purpoſes. Theſe Eggs remain there all the Autumn, and Winter, without the leaſt Injury; and the Manner in which they are fixed and diſpoſed, ſhelters them from the Froſts that ſometimes don't ſpare the Tree itſelf. The Young conſigned to the Care of an affectionate and tender Providence, never quits the Egg till its Suſtenance is provided for it, and the Leaves begin to ſhoot from their Buds: But when once thoſe Leaves are expanded, the Worms break their Shells, and diſperſe themſelves over the Verdure; by Degrees they increaſe in Bulk, and at the End of a few Months, diſtribute upon the ſame Tree, little Balls of Silk, which look like golden Apples amidſt the beautiful Green that embelliſhes and contraſts them. This Method of nouriſhing them is moſt conducive to their Health, and occaſions the leaſt Trouble; but the Inequality of our Climate makes it liable to many ill Conveniences that are not to be remedied. 'Tis true, we might with Nets, or ſome other Invention, preſerve the Worms from the Depredations of Birds: But the Severity of the cold Seaſon, which ſuddenly ſucceeds the firſt Heats very frequently, and beſides this, Rains and violent Winds make a general Deſtruction. 'Tis neceſſary therefore to bring them up in the Houſe, in the Manner her Ladyſhip practiſes; and I beg the Favour of her to let us into the Particulars.

Counteſs. We chuſe a Room in a good Air *, and where the Sun has a free Admiſſion. This Apartment muſt be defended from the Blaſts, by Windows well glazed, or Frames of ſtrong Cloth. Care muſt likewiſe be taken that the Walls be well plaiſtered, and the Floor very firm. In a word, all the Avenues muſt be inacceſſible to Inſects, Rats and Birds. In the middle of the Room you muſt raiſe four Columns or Pieces of Wood that may form a large Square. From one Column to the other, ſeveral Hurdles, made of Oſier Twigs, muſt be extended in Ranges one above another, and under every Range there muſt be a Floor, bordered round with a Ledge; theſe Floors ſlide into a Groove, and may be fixed or diſplaced at Pleaſure.

Their Suſtenance.

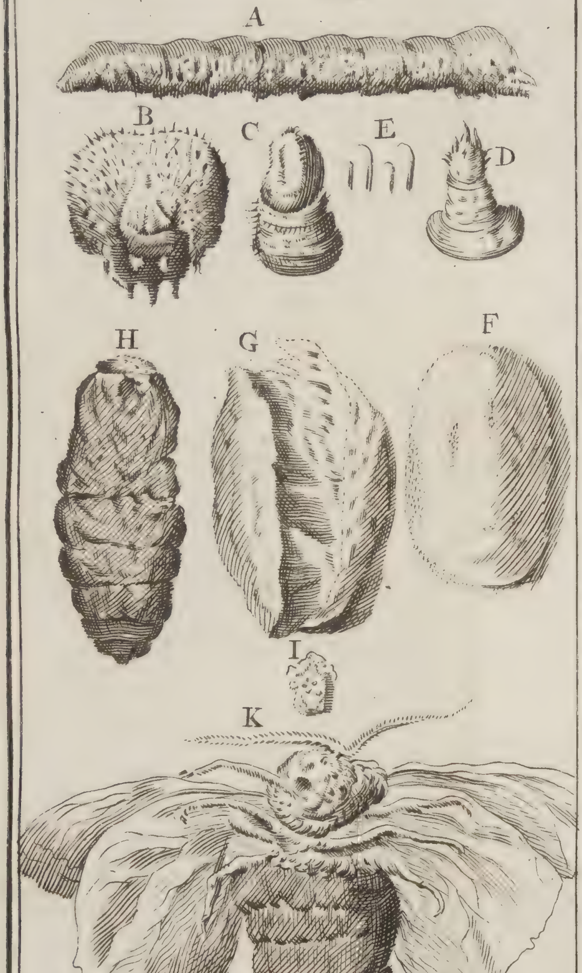
When the Worms have left their Eggs 'tis cuſtomory to ſpread ſome ſoft Leaves of the Mulberry Tree over the Linen or Paper of the Box, where they were hatched, and which is then large enough to contain a great Number of them. When they have gained a little Strength, they muſt be diſtributed upon Beds of Leaves, along the Ranges of the Square, that is in the middle of the Room, and round which there ſhould be a free Paſſage. They faſten upon the Leaves, or elſe on the Oſier Twigs, when they have eaten the Leaves. They are furniſhed with a Thread, by which they ſuſpend themſelves as they have Occaſion; and by this means avoid the Shock of a Fall. Every Morning they muſt be ſupplied with freſh Leaves lightly ſcattered over them in an uniform Manner. The Silk Worms, upon this, immediately quit the old Leaves, which muſt be all removed, and care taken that the Inſects be not carried away with them; and therefore 'tis neceſſary to employ a diſcreet and diligent Servant, whoſe Buſineſs muſt be to feed and keep them clean in a proper Manner; for nothing injures theſe Creatures ſo much as Moiſture and Impurity.

* Marc. Hieron. Vida Bombyc. c. 1.

purity. In order to preſerve them from the Diſtempers to which they are ſubject, the firſt Care of the Governeſs ſhould be, to gather Leaves for them in a dry Seaſon, and preſerve them in a Place where no Moiſture can come; ſhe muſt likewiſe do this before the Rains fall, that ſhe may not be obliged to dry the Leaves, and make her young Nurſery ſometimes faſt, which would ſoon be very prejudicial to them; for theſe minute Animals being to live but a ſhort Period, make the beſt of their Time, and are always eating to the very laſt Seaſon of their Moulting; after which they continue to live almoſt as much longer without feeding at all. When the Mulberry Leaves happen to fail, you may, till there is a new Supply, give them the Leaves of Lettuce or Holly-Oak, tho' this is a Collation they have very little Reliſh for. Neceſſity alone obliges them to ſubmit to it; and the Silk they then ſpin has evident Marks of the Ceſſation of their uſual Food, and proves but indifferent.

There is another Precaution almoſt as neceſſary as the Choice and good Management of their Proviſions, and that is, to let freſh Air into the Room from Time to Time, in a fine Sun-ſhine; and to keep as neat as poſſible, not only the Floors appointed to receive the Fragments of their Leaves and other Impurities, but likewiſe all the Place in general. Cleanlineſs and good Air greatly contribute to their Welfare and Growth. We now come to the different Stages through which they paſs.

The Worm, when it leaves the Egg, is extreamly ſmall, it is likewiſe perfectly black; but its Head is of a more ſhining Sable than the reſt of its Body. In a few Days it begins to aſſume a whitiſh Hue, or an Aſh Gray. After this, its Coat ſullies, and becomes ragged, at which time the Animal caſts it off, and appears in a new Habit. It increaſes in Bulk, and grows whiter, tho' a little tending to the Green, with which it is repleniſhed. After a few Days, the Number of which varies according to the Degree of Heat, the Quality of its Food, and the Conſtitution of the Animal, it ceaſes to feed, and ſleeps almoſt two Days; at the End of which 'tis exceedingly agitated and tormented, and grows almoſt red with the Efforts it uſes. Its Skin wrinkles and ſhrinks into Folds, and the Inſect then diveſts itſelf of it a ſecond Time, and throws it aſide with its Feet. It now appears



Silk Worms.

appears in its third Habit, and very magnificent it is, conſidering it is furniſhed out in the Space of three Weeks or a Month. It begins to eat again, and you would then take it for another Animal, ſo different are its Head, its Colour, and whole Form, from what they were before. After it has continued eating for ſome Days, it relapſes into its Lethargy; at the Concluſion of which it quits its Covering, as uſual: That is to ſay, it diveſts itſelf of three different Skins from the Time it leaves the Egg. It continues feeding ſome Time longer; and at laſt entertains a Diſreliſh for the World and its Enjoyments: It renounces all Feaſts and Society, and prepares for Solitude, by building with its Thread a little Cell of a raviſhing Structure and Beauty. But before I introduce it into this Manſion, I ſhould be glad to be informed by the *Prior*, who has carefully examined all theſe Operations, what is the inward Arrangement of a Silk Worm's Body; and from whence it receives the Materials of that beautiful Thread it preſents us with; and how the Creature manufactures it. You learned People diſcover that with your Glaſſes, which eludes the moſt attentive Eyes.

The Anatomy of a Silk-Worm.

Prior. In a few Words, Madam, this is the Anatomy of a Silk-Worm; at which your Ladyſhip may aſſiſt with all imaginable Decency. This Worm, like other Caterpillars, is compoſed of ſeveral elaſtick Rings, and is likewiſe accommodated with Feet and Claws, to fix itſelf in a convenient Situation. It has a little Skull to cover the Subſtance of the Brain, which deſcends and is communicated by ſmall Vertebras, from one Extremity of of the Body to the other. * It has two Rows of Teeth in its Mouth, which don't move up and down like ours, but work from the Right to the Left: Theſe Teeth enable it to ſaw and dilacerate the Leaf. When the Animal cuts it, ſhe preſſes one ſide of the Leaf, and proceeds with a ſlanting Motion, as we ourſelves would cut it with a Pair of Sciſſars, by continuing from the Top to the Bottom †. One may eaſily diſtinguiſh the Palpitation of its Heart, which cannot be performed without proper Veſſels to circulate a Fluid through the whole Body. From the Head to the Extremity of the Tail, is extended a kind of little Nerve, which we call the Spine; becauſe it incloſes, in the Joints that form it, a Marrow like the Brain: This Spine that is placed in the Middle of the Body, and continued thro' its whole Length, ſuſtains the Heart and Lungs. The former of theſe is a Tube extended through the whole Length of the Worm, and is compoſed of ſeveral minute Cells, which enlarge the Middle, and diminiſh at the Points of Contact, and is compoſed of many oval Veſſels. The Lungs are a double Chain extended on each Side, and compoſed of ſeveral Rings which correſpond with the Orifices we ſee diſtributed along the exterior Sides of the Worm. It is through theſe Openings that the Air flows into the Lungs, and by its Spring and Expanſion, promotes the Circulation of the Chyle or Humour which nouriſhes the Silk-Worm, as we have found by Experience. Drop a little Oil upon the Head, the Back, or Belly of this Inſect, it will ſtill continue alive; but if you rub Oil, Butter, Sewet, or any other ſuch fat and thick Matter, on the Sides of the Creature, you then obſtruct the Vents, which convey the Air to the Lungs: and accordingly it immediately falls into Convulſions and dies, unleſs you relieve it by renewing the Communicatiou of the Air.

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* Leuwenhoek, Arcan. Nat. Tom. iii. Ep. 146.
† Malpigh. Ibid.

The Spine.

The Heart and Lungs.

Between the Heart and Lungs, are the Ventricles and Inteſtines, where the Digeſtion is performed. The whole Syſtem of theſe Veſſels is incompaſſed with almoſt innumerable Folds and Windings, formed by a very long and ſlender Bag, which contains a ſort of Gum, coloured like a Marigold, of which the Worm makes its Silk.

The Inteſtines

The Bag of Gum.

You may have ſometimes ſeen in the Work-Rooms of Goldſmiths, or Gold Wire-Drawers, thoſe Iron Plates that are pierced thro' with Holes of unequal Dimenſions, throw which they draw, and leſſen at Pleaſure, Gold or Silver Wire. Theſe Plates are called Wire-drawing Irons. The Silk-Worm has under her Mouth ſuch a kind of Inſtrument perforated with a Pair of Holes, thro' which ſhe draws two Drops of the Gum that fills her

Bag. Theſe are like a Couple of Diſtaffs, that continually ſupply the Materials out of which ſhe ſpins her Thread. She fixes both theſe Drops where ſhe pleaſes, and then draws back her Head, or lets herſelf fall. The Gum that flows thro' theſe Openings, receives their Form, and lengthens into a double Thread, which immediately loſes the Fluidity of the Liquor that compoſes it, and acquires a Conſiſtence ſufficient to ſuſtain or enfold the Worm at the proper Seaſon. She is never deceived in adjuſting the Dimenſions of the two Apertures, or calculating the due Thickneſs of the Thread: She always makes the Strength of it proportionable to the Weight of her Body. She unites the two Threads by glewing one over the other with her fore Paws; and when the Time for making her Cone comes, ſhe employs the Fingers that her Paws are furniſhed with, in either twiſting or glewing the two Threads together, or fixing her Silk ſometimes in one Place, and ſometimes in another; and I aſſure you I have frequently ſtood ſtill to obſerve the graceful Attitude in which ſhe ſpins, as well as the Induſtry that ſhines through all her Work.

Their manner of Spinning.

It would be a very curious Thing to know how this Gum which compoſes the Thread, is ſeparated and drawn off from the other Juices that nouriſh the Animal. It muſt be accompliſh'd like the Filtrations and Secretions of ſome Humours formed in an human Body. I am alſo perſuaded that the Silk-Worm, at the Entrance into the long Bag we have been deſcribing, is furniſhed with a Set of little Glands, which being impregnated with Gum, afford a free Paſſage into the Bag, to all the Juices of the Mulberry Leaf that correſpond with this glutinous Matter, and exclude every Fluid of a different Quality. As to the Remainder of the Aliment, one Part, by Virtue of its Fineneſs, is received into little Veſſels which convey the Chyle, or nutrimental Juices to the Heart. The other Part, which is the Dregs, meets with Paſſages proportioned to its Groſſneſs. But I tire you with my Diſſertation, and find, that, whenever the *Counteſs* is ſilent, 'tis all loſt Time to the *Chevalier*.

Chev. Let me have your Ladyſhip's Permiſſion to contradict the *Prior* a little. I never had a Moment's Uneaſineſs in his Converſation, and when I find any Difficulty in his Deſcriptions, I am eaſed of it by bringing him upon the ſame Subject another time But I confeſs I am very impatient to know, how Silk-Worms and other Caterpillars, wrap themſelves up in their own Thread, and work it into an Habitation or a Tomb.

Conteſs. I have picked up by Chance three * or four Cones of thoſe Worms, who finiſhed their Work much later than the reſt. They are laid in a Paper, and I muſt give the *Chevalier* a Sight of them.

Chev. How, Madam? are the Silk-Worms within?

Conteſs. Yes, like Solitaries in ſo many Hermitages; let us take the Sciſſars and cut open the Cones.

In the firſt Place, take Notice of the Down or Flue, which is the Heap of bad Silk you ſee there, ſcattered at a Venture, and taking up a great deal of Room. In the next Place, you may ſee the fine Silk all compact, and ranged with the utmoſt Propriety. And laſtly, obſerve the Shell, which is a Compoſition of Silk and Glew, and reſembles a very ſtrong Stuff. Within that you will find the Worm in Miniature, and changed into a *Nymph.* Take it in your Hand.

Chev. 'Tis made like a Bean, without Feet, Head, or any diſtinct Part: One may ſee, however, ſeveral little Rings that gradually diminiſh towards the Extremity, and have ſome Motion when they are preſſed.

Prior. 'Tis the *Nymph* that incloſes the Body of the Butterfly: The Wings, Feet, Eyes, Horns are all there now: but in a manner not to be diſtinguiſhed. Fifteen Days hence the whole will be diſengaged.

Chev. But if the Silk-Worm is concealed under the Down, when ſhe ſpins regularly, how is it to be known in what manner ſhe has raiſed all this Work?

Conteſs. Nothing is more eaſy: When the Creature is ſatiated with Leaves, and the Time for its laſt Transformation is arrived, it ſeeks for a Place where it may build itſelf an Abode without Interruption. We uſually give it ſome little Stalks of Broom, or a Piece of Paper rolled up, into which it retires, and begins to move its Head to different Places, in order to faſten its Thread on every Side.

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* The Cone is a Ball of Silk in which the Worm enfolds itſelf.

All this firſt Work looks like Confuſion, but it is not without Deſign. The Worm neither arranges its Threads, nor diſpoſes one over another; but contents itſelf with diſtending a ſort of Cotton or Flue, to keep off the Rain; for Nature having ordained them to work under Trees, in the open Air, they never change their Method, when they are even rear'd in the Houſe.

When my Curioſity led me to know how they ſpun and placed their beautiful Silk, I took ſome of them, and frequently removed the Flue, with which they firſt attempted to make themſelves a Covering; and as I weaken'd them exceedingly, when they were at laſt tired with beginning a-new, they faſtened their Threads upon what came in their way, and began to ſpin very regularly in my Preſence, bending their Heads up and down, and then croſſing to every Side. The Worm, at that time, confined its Motions to a very contracted Space, and by Degrees had entirely ſurrounded itſelf with Silk. The Remainder of the Operation is inviſible, but one may gueſs how it was accompliſhed. The Animal, to finiſh its Mantle, drew out of its Bag a Gum, which it ſpun into a leſs delicate Silk, and then thicken'd it with a ſtrong Glew, which ſerved to bind all the laſt Ranks of this Silk over one another.

Here then are three Coverings entirely different, which afford her a Succeſſion of Shelter: The Flue keeps off the Rain; the fine Silk forms a Tiſſue that prevents all Acceſs of Air; and the glew'd Silk, which compoſes the thick Shell that touches the Worm, not only repels the Water and Air, but alſo renders the Inſide of this Habitation inacceſſible to the Cold. After ſhe has been in this Retreat long enough to be changed into a *Nymph*, by diveſting herſelf of her fourth Skin, and to be transformed, from a *Nymph*, into a Butterfly, by a gradual Expanſion of her Horns, Wings and Feet, that were glew'd up and enfolded in the *Nymph*, as in a Caſe, 'tis then time for her to make her Appearance.

Chev. That muſt be a difficult Affair. Is ſhe provided either with Saws, or a Gimlet, ſtrong enough to pierce through the Shell, the Silk, and the Down? In my Opinion ſhe ſeems to be ſtrongly immured.

Counteſs. That Being who teaches the Worm how to build herſelf a Place of Reſt, where the delicate Limbs of the New Animal may be formed without Interruption, inſtructs that Animal likewiſe how to open a Paſſage for its Flight. The Cone is like a Pidgeon's Egg, and more pointed at one End than the other. The Worm does not interweave its Silk towards this Extremity, nor apply its Glew there, as it does in every other Part, by bending itſelf all around, with great Pliantneſs and Agility; and laſtly, ſhe never fails to fix her Head oppoſite to the pointed Extremity; and I will acquaint you with the Reaſon: This Part is not ſo ſtrongly cemented, nor exactly cloſed as the reſt. She is conſcious, this is to be the Paſſage for the other Animal ſhe carries in her Bowels, and has therefore the Precaution never to place this Extremity, or pointed End, againſt any Subſtance that might obſtruct the Creature at the Seaſon of its Egreſs. When the Worm has exhauſted itſelf, to furniſh the Labour and Materials of theſe three Coverings, ſhe reſigns her Form of a Worm, her Spoils drop all around the *Nymph*, who is not converted into a perfect Butterfly, till the Expiration of fifteen Days, or three Weeks, and ſometimes a longer Space of Time. This new Animal, when its Formation is compleated, extends its Horns, together with its Head and Feet, towards the Point of the Cone, which, not being cloſed up in that Part, gradually yields to its Efforts: it enlarges the Opening, and at laſt comes forth. At the Bottom of the Cone, the Ruins of its former State are to be found, I mean the Head and entire Skin of the Worm, which then bear ſome Similitude to an Heap of foul Linen. I forgot to acquaint you, that the Butterfly, before it quits its Repoſitory, frees itſelf from the ſuperfluous Humidity, which before contributed to form and fortify its Limbs. This Evacuation ſoils the Ball, and very much damages the Silk.

Chev. What becomes of the Butterfly after this?

Counteſs. It wanders, but a little Diſtance, from the Place it quitted. The Male is more lively and ſmaller than the Female. She is larger, becauſe ſhe is full of Eggs, which ſhe lays a few Days after; and if they have an Prolificneſs, they change their Complexion at the Approach of Spring, from a yellow Citron to a bluiſh Caſt, and afterwards an Aſh Grey.

Chev. At preſent, Madam, I am anxious to know in what Manner you wind off the Silk, and how you uſe it. For if the Butterfly, before it forſakes the Cone, diſcharges a Liquor that corrupts it, and if ſhe likewiſe pierces a Hole thro' it, it muſt certainly be all ſpoiled.

Counteſs. That is true; but there is no Uſe made of thoſe Cones which are pierced in this Manner; and beſides this, Care is taken to prevent that Inconvenience. A Female Silk-Worm ſometimes lays above five hundred Eggs. You ſee we need but a very ſmall Number of *Nymphs*, to ſtock the Laboratory for the enſuing Year. And the other Cones, from whoſe Silk we propoſe to make any Profit, are expoſed in the open Sun-ſhine, which, in Spite of all theſe different Tiſſues, penetrates to the *Nymph*, and kills her in leſs than ſix or ſeven Hours, and before ſhe has ſoiled any thing.

Prior. The *Chevalier* will be diſſatisfied, unleſs we likewiſe teach him how to wind off the Silk.

Counteſs. When we intend to ſeparate the Silk from the Cones, the Down muſt be cleared away in the firſt Place; and the Cones, with their Silk, are then thrown into warm Water; where they are ſtirred about with Twigs, in order to come at the Heads or Beginnings of the Silk. Theſe are drawn through little Rings, to prevent the Cones from riſing too high, when the Silk is faſtened to the Reel, and you begin to wind it. They alſo join together the Silk of ſeveral Cones, to a certain Number, as ſix; but generally eight, and ſometimes more, according as the Silk is intended to be made more or leſs ſtrong. The Cones remain in the Water till they ceaſe to furniſh any more Silk. But thoſe who wind it, don't wait till it is all exhauſted; becauſe it changes its Colour and grows weaker toward the End. But even this laſt Part of the Silk is not without its Beauty, and they wind it off by itſelf. As to the Cones, they are uſeful on ſeveral Occaſions. Some People ſtain them with a Variety of Colours, and form them into artificial Flowers, which are ſometimes finiſhed with the utmoſt Perfection. The common Practice is, to leave them in the Water, till all the Glew be evacuated, and then they are carded like Wool, and yield a kind of ſilken Flax; which is ſpun with a Wheel, in order to weave it into Stuffs of a moderate Value. But I am very indiſcreet to trouble you with all the

Particulars of this Work. Make the *Prior* a Viſit, Sir: He has invented a Reel of a particular Form, with which you may learn to wind off the Silk very judiciouſly.

Prior. It was merely to ſatisfy her Ladyſhip's Curioſity, and to know the exact Length of the Silk produced by theſe Worms, that I ordered a little Reel to be made, each of whoſe four Sides, contains three Inches in Length. But ſince I have compleated my Experiment, I renounce the Trade for the future.

Counteſs. But what do you gain by theſe Dimenſions.

Prior. The four Sides, taken together, are equal to twelve Inches, or a Foot; I am ſure then, that each Turn of the Silk, upon the Machine, is equivalent to that Meaſure, and ſometimes a little more; becauſe the Rounds are enlarged, when they fold over one another. At every Turn of the Handle, I wind off a Foot of Silk; I have only then to reckon, how often I turn the Handle of the Wheel for one Silk-Worm, in order to know, at the ſame Time, how many Feet it produces.

Counteſs. You are certainly in the Right; and have you made the Experiment, Sir?

Prior. I made it upon two Cones of Silk, and found nine Hundred and twenty-four Feet in one, and nine Hundred and thirty in the other. Take Notice, if you pleaſe, that the Thread is double, and glewed one over the other, through its whole Length, which conſequently amounts to near two Thouſand Feet of Thread.

Counteſs. We muſt only compute nine Hundred and thirty, becauſe we receive the Thread in the ſame Condition from the Silk-Worm. I aſſure, you, Sir, I did not expect half that Quantity, and entirely depend upon your Exactneſs.

Prior. Beſides this, I made another Remark: I weighed the nine Hundred and thirty Feet of Silk. The *Chevalier* knows that a Pound contains two Marks, a Mark eight Ounces, an Ounce eight Drams, a Dram three Penny-weights, and a Penny-weight, four and twenty Grains; which laſt is a Weight ſo inconſiderable, that a Breath of Wind eaſily wafts it away. The nine Hundred and thirty

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* Boyle de Subtilit. Effluv.

Feet of Silk, weighed with the greateſt Exactneſs, were no heavier than two Grains and a half.

Counteſs. Do you know the Difference between this Thread, and that which is made by the experteſt Spinſter in the World?

Chev. The ſame that there is between a Rope, and a String of Packthread.

Counteſs. Rather ſay, between a needleful of fine Thread and the largeſt Cable. But let us take a Walk, Gentlemen, and enjoy the Benefit of the Air. What ſhall be the Subject of our Converſation To-morrow?

Prior. What your Ladyſhip pleaſes to appoint.

Counteſs. In Reality, I am very much tempted to be one of your Party. But it ſhall not be ſaid, that you admit me into your Society merely to do me Honour. I will be faithful to the Laws of the Company, and intend to aſſiſt regularly at your Aſſemblies; but, if you pleaſe, it ſhall be upon Condition, that you confine your Speculations to my Capacity: As many Remarks as you pleaſe on the Things I know. Let us talk of Gardens, Herbs, Fruits, and domeſtick Animals: I have ſome ſmall Acquaintance with what we ſee every Day; but pray don't pretend to make me ſoar to Heights I can never reach.

Prior. You, yourſelf, Madam, ſhall be our Preſident and regulate the Subject of our Conferences.

Counteſs. I take you at your Word; and if you pleaſe, we will purſue our Subject of Spinning: A few Days ago, you deſcribed a Spider's Manner of working, and may remember the Pleaſure with which your Account was received. No one expected to find ſo much Skill and Novelty, in any Animal who makes ſuch a diſagreeable Appearance. *Chevalier*, I promiſe you this Deſcription for your Entertainment To-morrow; but adviſe you to do one Thing in the Interim.

Chev. What may that be, Madam?

Counteſs. To paſs away a little Time with ſome Weaver; they are numerous enough in this Country, and it may be proper for you to be very exact, in obſerving how they make our Cloth, that you may the more eaſily comprehend the Deſcription, the *Prior* will give us, of a Spider's Method of working; in Reality, the one will aſſiſt you to underſtand the other; You muſt expect, indeed, to ſee very poor People; but their Trade will give you abundance of Satisfaction. The Invention of it is ancient, though it will appear a Novelty to you, and you will diſcover Ingenuity enough there, to return very well ſatisfied with my Advice, as well as with what you ſhall happen to ſee.

Chev. Will your Ladyſhip be pleaſed to let me take one of your Servants with me, to ſhew me the Way?

Prior. With your Permiſſion, Sir, I ſhall charge myſelf with that Care, and it's proper I ſhould be there, to ſerve you as an Interpreter. Theſe Good People ſpeak a Language you are quite unacquainted with, and I am not very certain they will underſtand yours.

Counteſs. Chevalier, pray accept of theſe two Crowns, perhaps, you may be unprovided with Money, and it is proper to make them a ſmall Acknowledgment; when you ſpeak to them by a Preſent, you need no other Interpreter.

The End of the third DIALOGUE.

SPIDERS.

DIALOGUE IV.

The COUNTESS,
The PRIOR, *and*
The CHEVALIER.

Counteſs. CHevalier, before we come to your Inſects, I ſhould be glad to know your Thoughts of a Weaver's Loom; do you now diſtinguiſh the Warp * from the Woof †.

Chev. I am Maſter of all this, and can tell you the Uſe of the Treadles §, and Stays ‖, as well as the Comb ‡, Shuttle **, and ——

Counteſs. He is going to tell us the Name of every Part of a Loom. I fancy you did not think your Entertainment low, or diſagreeable.

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* The Warp is the Thread which is fixed on the Loom.

† The Woof is a Thread that paſſes with the Shuttle croſs the Warp.

§ The Treadles are Pieces of Wood which the Weaver alternately lowers with his Feet, in order to raiſe, and fall the Stays.

‖ The Stays are two Ranges of Threads hung on Pullies, the Working of which alternately, raiſes and falls ſome Part of the Thread of the Warp.

‡ This Inſtrument is a long Comb, croſs which paſs all the Threads of the Warp, and which ſerves to compact the new Thread with the preceding.

** The Shuttle is a little Inſtrument made of Box, in Form of a Ship; in the Middle of which the Weaver inſerts the Woof, that plays off through a little Hole.

Chev. Nothing ever amuſed me better, and I am very deſirous of ſeeing all the Implements of each Artiſan one after another. I cannot comprehend why they ſhould be concealed from us. If by Chance you ſtop to take a View of an Handicraft's-man's Work, you immediately meet with People, who, with a very ſerious Air, aſk you what you are amuſing yourſelf with, and give you to underſtand, that you are attentive to what is much beneath you.

Counteſs. I am exceedingly pleaſed with the *Chevalier*'s Chagrin, they may make a great Affair to him, if they pleaſe, of his *Latin*, and other neceſſary Sciences; but why ſhould he not be likewiſe permitted to amuſe himſelf with the moſt common Employments of Life, that are conſtantly practiſed?

Prior. There would be ſomething much above a mere Amuſement, to be gained by it. The Judgment would be cultivated, becauſe it would acquire juſt Ideas of every Thing, in an agreeable Manner. The View of Arts and Profeſſions, and of Men in all Situations and Employments, affords a perpetual Source of Experience, entirely calculated to give Inſtruction, without Expence, or Fatigue. We there learn not only whatever is capable of enriching the Mind, and embelliſhing Converſation, but likewiſe that which makes a Man uſeful, and of Conſequence upon all Occaſions. Her Ladyſhip's Son, who is certainly one of the moſt refined and amiable young Gentlemen one can poſſibly ſee, has been educated in this Taſte. After he had been compleatly verſed, by different Maſters, in all the neceſſary Tongues and Exerciſes, the Article of travelling began to be thought of; but the *Count* would not ſuffer him to go to *Germany*, where he now reſides, till he had devoted every Morning, for a whole Year, in the Study of Natural Philoſophy, or the moſt amiable Parts of Nature; and beſides this, his Afternoons were generally employed in obſerving, as well as learning, to a certain Degree, the nobleſt Trades and Profeſſions, without diſdaining even the moſt common. He never paſſed a Week without going to School at ſome Shop in *Paris*, not in a ſuperficial Manner, but by making it his ſerious Endeavour to get a competent Idea of the real Object, and moſt valuable Method of each particular Trade. He attended a

Gold-Wire Drawer, a Printer, a Clock-maker, and a Dyer, for near three Weeks. He beſtowed as much Time on a Joyner, a Smith, and even a Carpenter; and never left his Man, till he had ſeen him in all the Forms and Undertakings of his Profeſſion. The repeated View of the ſame Works, the plain Converſation of the Artiſans, the Approbations, or Complaints of the Maſters, the various Difficulties, Precautions, and Remarks of the Buyers, made every Art and Trade ſo familiar to him, that at preſent he knows each Particular that relates to the Commerce of Life, as well as even thoſe by whoſe Labours it is ſupplied: He knows the Names and Uſe of all the Tools, is acquainted with the Materials employed by the Workmen, as well as the Countries that produce them; he underſtands the Marks of their good, or bad Qualities, and what they are worth, either at firſt, or ſecond Hand. He can diſtinguiſh the Touches of an Artiſt, and diſcern the Difference between a Work of Solidity and good Taſte, and one that only ſtrikes the Eye, and is of ſlight Texture. A diſhoneſt Workman can never impoſe upon him; but then he likewiſe knows how to do Juſtice to the Performance of an able Maſter: Nay, he goes farther, he is an Artiſt himſelf, and makes whatever he has Occaſion for, with his own Hands.

Counteſs. I allow you to enlarge on my Son's Commendations, becauſe you have ſo great a Share in them yourſelf. I have infinite Obligations to you, Sir, and can't imagine what peculiar Dexterity you practiſe; but when you uſed to diſengage yourſelf a few Hours ſometimes, from your common Employment, to take a Walk with my Son; you gave him a Taſte of the Manufactures and Sciences, in a Manner that charmed him. Your Method, as it appears to me, was not ſo much to make him underſtand, at once, a Set of Sciences, as to raiſe in him a Deſire to underſtand them; your Intention was to make him curious, becauſe Curioſity is an active Paſſion, that can never be indolent; and when this Point is once accompliſhed, all the Reſt come without Reluctance or Diſtaſte. I have frequently taken Notice, that your Diſcourſes, and Compliances, nay your very Diverſions, only tended to ſharpen the Youth's Curioſity. It was very pleaſant, for Inſtance, to ſee the Curate and his little Pariſhioner diſputing, ſometimes by the Water-ſide, which Stones were the flatteſt; and then to obſerve each of them raiſe his Heap; and, with a Kind of Emulation, ſkim the Stones along the Surface of the Water; and when they were weary of their Employment, to ſit down and make Diſſertations on the Deſcent of Bodies, the Level of the Water, the Lines of Incidence and Reflection, as I think they called them, the Preſſure of the Air, and ſeveral other Matters that are ſlipp'd out of my Memory. When this Dialogue was over, they went to work with their Sticks, on the firſt ſmooth Bed of Sand they ſaw, there they traced out the *Holy Land*, *Italy*, or *France*, and even proceeded to the *Indies*, and *Canada*; and if they wanted Sand, they made uſe of Stones, Leaves, and Apples, with which they ſketch'd out Provinces, Mountains, or Cities: Every Day produced ſome new Invention. 'Tis impoſſible to deſcribe the Air, and Delight, with which my Son repeated theſe Performances in my Preſence; every thing was ſo familiar to his Imagination, and ſo well methodized in his Mind, that whatever he learned in this amuſing Manner, was repeated to me in a very exact Order, and the *Prior*, without knowing it, gave Inſtructions to two Perſons inſtead of one.

Prior. As I was his Paſtor, I could not beſtow my Time better, than in devoting ſome of my Care to his Improvement; but when one meets with a fine Genius, it is impoſſible to be too ſedulous in preſerving it from every diſagreeable Impreſſion. And I can aſſure your Ladyſhip, I have employed no Part of my Time with ſo much Advantage, as thoſe Hours I have paſſed away in little Amuſements with this amiable Youth.

Counteſs. There are but too many, whoſe Amuſements are no more than Trifles, and indeed few are capable of giving them an agreeable Turn, or know how to mix Deſign with their Diverſions, and promote Virtue by the Mediation of Pleaſure.

Chev. I muſt give you, Madam, another Inſtance of the *Prior*'s Abilities. When he had explained to me, Yeſterday, all the Parts of a Loom, and ſhewn me how they were uſed: *Well, Mr.* James, ſaid he, to one of the Workmen, *will you let me have your Place? It is my Turn to Day*. Upon which he immediately put the Treadles and

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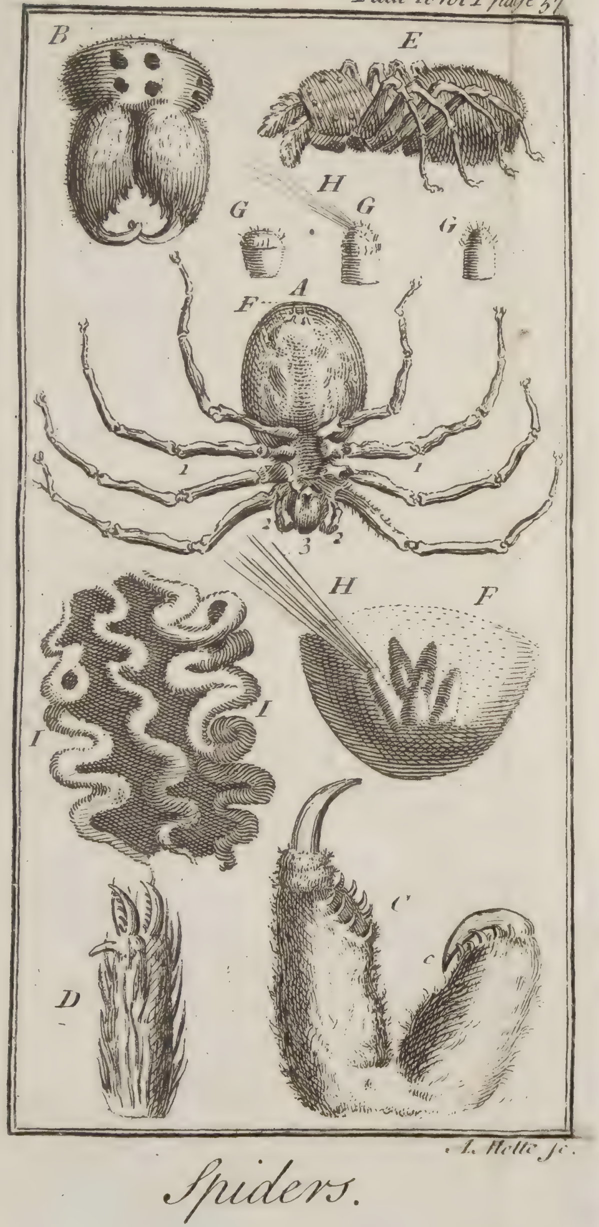

A. Holte ſc.

Spiders.

the Shuttle in Motion, promiſing to pay Ten-pence for every Thread he ſhould happen to break. After which he aſked me, If I would *handle the Loom on the ſame Terms? Why not*, replied I? Upon which the Gentleman gave me his Place, and I began to work; but ——

Counteſs. Didn't you ſpoil all?

Chev. It went on very indifferently at firſt, and I paid the Fine agreed upon, which coſt me ſome Money; but I was in a little Time as dextrous as another. Our good People were highly delighted to ſee their Work all wrong, and every broken Thread, was as good to them as a Victory.

Prior. Well; let us talk no more of the *Prior* and the Weavers, but come to the Web of another make, that requires neither Loom, nor Shuttle; her Ladyſhip will not be offended if I deſcribe the Spider and her Tools, before I ſpeak of her Work.

Counteſs. Go on, Sir; you may talk of Dragons and Serpents, who are as little diſagreeable to me; for the Deſcription of the moſt frightful Object is capable of creating Pleaſure.

Prior. There are five Sorts of Spiders *: Firſt, the Houſe Spider, who hangs her Web in neglected Apartments: Secondly, the Garden Spider, who weaves, in the open Air, a little round Web, the Center of which is her Situation in the Day-time: Thirdly, the Black Spider, to be met with in Cellars, and the Cavities of old Walls: Fourthly, the Wandering Spider, who has no ſettled Neſt, like the others: Fifthly, the Field Spider, which they call the Long-legs.

All theſe Animals have ſomething in common with each other, and likewiſe ſomething that diſtinguiſhes them. Let us, in the firſt Place, conſider what they all agree in.

The Fore-part of a Spider.

Every Spider has two Parts, of which the Fore-one, that contains the Head and Breaſt, is ſeparated from the Hinder-part, or Belly, by a Ligature, or very ſlender Thread. The Fore-part is covered with very ſtrong Scales, and ſo are the Feet, which are inſerted in the Breaſt. The hinder Part is cloathed with a very fine and ſupple Skin, and the whole inveſted with Hair. In different Parts of their Head, they have ſeveral fine Eyes, generally eight, and ſometimes no more than ſix, two in the Fore-part, two in the Hinder, and the reſt in the Sides. They are all without Eye-lids, and are covered with an hard, poliſhed, and tranſparent Cruſt. As theſe Eyes are immoveable, they have been multiplied in this Manner, to give them Intimations on all Sides, of whatever relates to them. All theſe Creatures, in the Fore-part of the Head, have two Stings, or rather Branches, ſhagged, or indented with ſtrong Points, like a couple of Saws, and ending in a Nail made like the Claw of a Cat. Near the Point of the Nail is a ſmall Aperture, through which, it is evident, they eject a very violent Poiſon. They have no Arms ſo formidable to their Enemies as theſe. They open and extend their two Branches as they have Occaſion, and when they no longer make uſe of the Nails, they bend, and bring each of them down upon its Branch, like a Pruning Knife, claſped upon its Handle. They all likewiſe have eight Legs, jointed like thoſe of Crabs; and at the Extremity of theſe Legs, three crooked and moveable Claws; that is to ſay, a ſmall one placed on one Side, like a Spur, by the Aſſiſtance of which, they faſten themſelves to their Thread; and two others of a larger Size, the internal Part of whoſe Curve is indented, and which ſerve them to fix themſelves where they pleaſe, and enable them to ſlide either obliquely, or with their Back downwards, by graſping whatever comes in their Way. Even poliſhed Bodies, ſuch as Marble, and Looking-Glaſſes, have thoſe Inequalities on their Surface, as enable theſe Creatures to faſten upon them, by the Point of their Claws; but as this Point would be impaired, were they always to reſt upon it, in their Progreſs from Place to Place, they are furniſhed with two little round Balls, or Sponges, on which they advance with a ſofter Pace, and draw in their bending Claws, in order to preſerve them on thoſe Occaſions where they can diſpenſe with their Agency. Beſides, theſe eight Legs,

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* The Memoirs of the Academy of Sciences. M. Homberg. *Leuwenhoek's* Arcan. Nat. Tom. iii Epiſt. 135. Liſter de Aran.

The Eyes.

The Stings.

The Legs.

The Claws.

Their Sponges.

Spiders have two others, inſerted into the Fore-part of their Body, and which we may call their Arms, ſince they do not uſe them for transferring themſelves from one Place to another, but only for holding, and turning their Prey. But with all this formidable Equipage, the Spider would be unſucceſsful in her Wars, were ſhe not as well accommodated with Inſtruments to form an Ambuſh, as with Weapons for an Attack. She has no Wings to aſſiſt her in the Purſuit of her Prey; whereas, her Prey is furniſhed with them for its Eſcape, and there would be too much Diſproportion in their Circumſtances, if the Spider had not a Stock of Thread, as well as a natural Induſtry to ſpin it into a Web and Snare, which ſhe ſpreads in the open Air, through which her Prey is continually paſſing. Inſtinct informs her when to ſet about her Work, and ſhe begins it when her Prey firſt receives its Birth; and then retiring into Obſcurity behind her Net, ſhe patiently awaits the Enemy, to whom ſhe herſelf is inviſible.

Their Thread.

I ſhall now deſcribe the Manner in which ſhe weaves and compleats a Web ſo advantageous to her Purpoſe. All Spiders at the Extremity of their Belly, have five Teats, or Papillæ, covered with other of leſſer Dimenſions, the Orifices of which they open and ſhut, as well as contract and dilate at Pleaſure. Thro' theſe Orifices they diſtil that clammy Gum with which their Belly is repleniſhed; and whilſt the Spider diſcharges it thro' one, or more Apertures, the Thread lengthens in proportion to her Diſtance, from the Place where ſhe firſt faſtened it. When ſhe cloſes the Openings of her Dugs, the Threads no longer lengthen, and ſhe remains ſuſpended in the Air. She afterwards makes uſe of this Thread for her Aſcent, by graſping it in her Paws, as ſome People climb up a Rope with their Hands and Knees. With this Thread ſhe ſpins a Web, that furniſhes her with Advantages of a very different Nature. I ſhall now deſcribe its Texture and Uſe.

The Web of an Houſe Spider.

When a Houſe Spider intends to begin a Web, ſhe firſt chuſes a Place that has ſome Receſs, as the Corner of a Chamber, or a Piece of Furniture, into which ſhe may retreat under her Web, and ſecure herſelf a Paſſage either upwards or downwards, and by theſe Means accompliſh her Eſcape from any Danger that may occur; ſhe ſheds upon the Wall a little Drop of her Gum, which immediately ſticks to it. The Spider then lets the Liquor diſtil through a ſmaller Orifice. Her Thread lengthens in her Rear, while ſhe proceeds from one Side, as far as the Place to which ſhe deſigns to extend her Web. The Thread is faſtened to one of her Spurs, leſt it ſhould fix along the Wall, whilſt her Intention is, that it ſhould only traverſe the Air. When ſhe is arrived at the Point to which ſhe purpoſes to continue her Web, from the oppoſite Side, ſhe there faſtens this firſt Thread by the help of the Glew; and afterwards draws it to her, firſt bending, and then ſtretching it tight. Cloſe by this Thread ſhe fixes another, which ſhe carries forward, by running along the firſt like a Vaulter on his Rope. She proceeds to glew the ſecond Thread, on one Side of the Point where ſhe began her Work. The two firſt Threads aſſiſt her, like a Scaffold, to build all the reſt. In this Manner ſhe paſſes and repaſſes ſeveral Times, connecting or ſeparating her Threads as ſhe judges convenient. I even ſuſpect, by the Expedition with which ſhe proceeds in her Work, that ſhe forms ſeveral Threads at once, and in order to keep them ſeparated at an equal Diſtance, without intermingling with each other, ſhe diſtributes them into the Teeth of the Comb which I have diſtinctly ſeen under each of the large Nails on her Paws. She afterwards ſtretches and binds theſe Threads, one after another, with the ſame Induſtry. Thus the firſt Range is hung, and we may call it the Warp.

Chev. I underſtand you, Sir, ſhe will preſently begin to ſpin her Threads tranſverſly, and that will make the Woof.

Prior. Perfectly juſt; but the Web of a Spider differs from thoſe we weave, in this Circumſtance, that in our Work, the Threads extended in Length are interlaced with thoſe that are carried on tranſverſly; whereas the Threads of a Spider's Woof only croſs the Threads of the Warp, and are glewed to them, in the Points where they mutually touch, and are not inſerted or interwoven. After this, the Spider doubles and trebles the Threads that bordered her Work, by opening all her Dugs at once, and glewing ſeveral Threads one over another. She is ſenſible that the

Extremity of her Web ought to be hemmed and fortified, to preſerve it from being torn? She likewiſe further ſecures and ſupports it with ſtrong Loops, or double Threads, which ſhe fixes all around it, and which hinder it from being the Sport of the Winds.

Chev. This is a Work that certainly deſerves our Admiration; but I ſhall ſtill have a real Pleaſure to ſee the Structure of the Lodge where ſhe lyes in Ambuſcade.

Her Lodge.

Prior. The Spider is well acquainted with herſelf, and conſcious that if ſhe made her Appearance ſhe would intimidate her Prey; and therefore, at the Bottom of her Web, ſhe contrives a little Lodge, where ſhe keeps Centry unſeen: The two Outlets, one above and the other below, with which it is accommodated, give her an Opportunity of being every where when neceſſary, and of viſiting and cleaning all Parts.

From Time to Time ſhe clears away the Duſt, that would otherwiſe be too incommodious to her Web, and ſweeps the whole, by giving it a ſhake with her Paw; but ſhe conſiders what ſhe is about, and ſo nicely proportions the Force of her Blow, that ſhe never breaks any Thing.

From all Parts of the Web are drawn ſeveral Threads, that terminate like Rays in the Centre, where ſhe retires and keeps her Watch. The Sound, made by the Vibration of one of theſe Threads, is communicated to her, and gives her Notice there is Game in her Nets, and accordingly ſhe ſprings upon it in an Inſtant. She derives another Advantage from this Retreat under her Web, and that is, the Opportunity it affords her of feaſting on her Prey in full Security, beſides concealing the Carcaſſes, and not leaving in the Purlieus, any Traces of her Barbarity capable of intimating the Place of her Reſort, and inſpiring Inſects with an Averſion to approach it.

Chev. I would willingly know, Sir, how Spiders are always ſupplied with Materials for Spinning; for People torment them exceedingly, and yet we find their Work repaired the next Day.

Prior. That Providence which knows the Spider is hated, that her Labours create her many Enemies, and that her Web is always in danger of being diſconcerted, has furniſhed her with a Magazine for frequent Repairs, and this Magazine, after it has been exhauſted, is ſtill replenished with freſh Recruits; however, this Reſervoir is drained in Time, for when they grow old, both the Gum and Sponges in their Feet are dried up.

Chev. How do they live then in that Condition?

Prior. They uſe Induſtry: An old Spider, who has no longer any thing to ſubſiſt on, ſeeks out a young one, and acquaints it with her Neceſſities and Intention; at which the other, out of Reſpect to old Age, or Apprehenſion of the Pincers, reſigns its Place to her, and ſpins itſelf a new Web in another Situation. But if the old Spider can find none of its Species that will, either by Conſent or Compulſion, reſign its Nets to her, ſhe muſt then periſh for want of Subſiſtance.

Garden Spiders.

Counteſs. The *Prior* has not yet entirely reconciled me to this Animal; but he has however cured me for ſome Time, of the Averſion I had to hear it ſo much as mentioned. Nay, I have proceeded farther: for I have obſerved, as well as I was able, the Work of a Garden Spider, and I find it very different. As her Labour has appeared to me to be very peculiar, I have a mind to give the *Chevalier* ſome Account of it. There are many People who believe ſhe flies, when they ſee her paſs from Branch to Branch, and even from one Tree to another; but ſhe tranſports herſelf in this Manner: She places herſelf upon the End of a Branch, or ſome other projecting Body, and there faſtens her Thread; after which, with her two hind Feet, ſhe ſqueezes her Dugs, and preſſes out one or more Threads of two or three Ells in Length, which ſhe leaves floating in the Air. Theſe Threads are wafted by the Wind from one Side to another, and lodged either on a Houſe or a Pole; ſometimes on a Tree or a Stake, croſs a Brook, and are there faſtened by their natural Glew: She afterwards draws them to her, to try if they are well fixed or not, and then they become a Bridge, over which the Spider paſſes and repaſſes in full Liberty. She doubles and extends the Thread as much as ſhe thinks fit, by joining the ſhorteſt Slips together, and then marches over a third Part, or to the Middle of the ſame Thread, and adds another to it, by the Aid of which ſhe deſcends till ſhe meets with a Stone, a Plant, or ſome ſolid Body to reſt on, or elſe ſhe leaves it to fluctuate in the Air, 'till it be fixed to ſome particular Place. By this ſecond Thread ſhe aſcends to the firſt, and at ſome Diſtance begins a third, which ſhe faſtens by the ſame Management. When ſhe has fixed three Threads, ſhe makes them ſtronger by doubling them; after which ſhe endeavours to project a kind of Square within them, which is eaſy for her to accompliſh, becauſe ſhe aſcends by the Thread which joins on the right Hand to that which is extended above, and then ſhe paſſes to the other which deſcends on the Left. During all this Progreſs, ſhe continually ſpins, and then ſhortens and bends the Thread which falls on the right Hand, and joins it to that on the Left, in what Part ſhe beſt approves, and by theſe means forms a Square, or ſome Figure that reſembles it. In this Square ſhe makes a Croſs, with the ſame Induſtry, whoſe middle Point becomes a Centre, to which ſhe draws Threads from every Side, like the Spokes of a Wheel, which all terminate in the Nave. This is the Warp or Baſis of the Work. She then ſpins a finer Thread for the Woof, and firſt places herſelf in the Centre, where all the Threads of the Warp meet and croſs one another. Round this Centre ſhe projects a ſmall Circle; after which ſhe begins another a little more diſtant, and always continues to draw this circular Thread from one Spoke to another, 'till ſhe comes to the large Threads which ſuſtain the whole Work. When the Net is thus ſpread, her next Care is to entrap the Game; for which Purpoſe ſhe places herſelf in the Centre of all theſe Circles, with her Head downwards; becauſe her Belly, which joins to a very ſlender Neck, would fatigue her too much in any other Poſition; whereas in this Poſture, it is ſupported by her Feet and Breaſt. In this Situation ſhe awaits her Prey, of which ſhe is not long deſtitute, for the Air is ſo repleniſhed with Flies, who are perpetually in Motion, that a ſufficient Quantity of them ſoon fall into her Toils. When a ſmall Fly becomes her Captive, ſhe diſpatches it upon the Spot, becauſe it is a Repaſt, which does not require much Preparation; but when her Proviſion is larger, and happens to be a ſtrong Fly who makes a vigorous Reſiſtance, the Spider, wheeling round, involves him in a Number of Threads, with which ſhe entangles, fetters, and then keeps him ſuſpended in the Air; after which ſhe bears him away to the

Neſt below her Web, and which ſhe conceals in the Leaves, or under a Tile, or ſome other Shelter, commodious either to paſs the Night in, or ſcreen herſelf from the Rain.

Chev. But this Work muſt be very brittle, Madam, and liable to be carried away by the leaſt Wind.

Counteſs. The Wind is not ſo injurious to it as you imagine, for the Web is very penetrable, and the Wind paſſes through and ſeldom diſorders it; what infeſts them moſt is the Rain; but as the Tiſſue of their Web is very thin and tranſparent, the Expence is inconſiderable, and they have always Materials for a new Net when they want it. This, Sir, is what I know of Garden Spiders; and I may add, that I lately made theſe Diſcoveries after I parted from you: I purſued the Inſect through all her Progreſs, on Purpoſe to render you a Piece of Service. As to the Spiders that harbour in Vaults, you will excuſe me if I can give you no Account of them.

The Black Spider.

Prior. This Animal contents herſelf with diſtributed her Threads about the adjacent Parts of her ſmall Cavern, and forms a little round Avenue in the Centre, to accommodate herſelf with a free Paſſage. When an Inſect flies about theſe Territories, it never fails to move one of thoſe Threads which are projected all around, like ſo many Rays. The Spider, at this Intimation, immediately quits her Ambuſcade. She is more malignant than any other Species of theſe Creatures; if you ſeize her, by the Aſſiſtance of two little Sticks, or in any other Manner, ſhe bites the Inſtruments that hold her. She is alſo much better fortified than other Spiders; and the Waſp, for Inſtance, who, by his Sting and repulſive Armour, ſo embarraſſes the reſt, never intimidates her: The Black Spider is not to be penetrated by this Sting; on the contrary, ſhe cruſhes the Bones and Scales of the Waſp with her Pincers.

I ſhall beſtow but a very few Words on the wandering Spider, and the Long-Legs or Field Spider.

The Wandering Spider.

The Wanderers are of ſeveral ſorts, and various Colours. They generally run and leap; and as they are not ſtocked with Thread enough, either to entangle their Prey when they want it, or to fetter the Wings of the Flies who incommode them, Nature has fixed in both their fore Paws, which we ſhall call their Arms, two Tufts of Feathers, with which they ſtop the Fluttering and Agitation of their Adverſaries Wings. There is another Species, not ſo large as this, of a blacker Complexion, and more ſingular than the reſt; and who, in the Months of *September* and *October*, extend their Threads along the Graſs in Meadows, or over the Stubble which remains after the Harveſt. She likewiſe abandons ſeveral of theſe Threads to the Wind, which bears them away. They frequently fill the very Air, and unite, lengthen, and fix on every Place. The Spiders who meet with this Thread faſten themſelves to it, and dart, as if they had Wings, to the Tops of Towers and the loftieſt Buildings.

Counteſs. You preſent us with a true Picture of great Proſperity, for the Attainment of which a Thread muſt firſt be found, that may guide to ſuch a Situation. When this is acquired, the Poſſeſſor is exalted, but then he hangs by a ſingle Thread. Be pleaſed now to come to the Field Spider.

The Field Spider.

Prior. Nothing is more remarkable in this Creature than the extreme Length and Delicacy of its Legs. As ſhe is deſtined to live amongſt the ſmalleſt Herbage of the Field, without ſpinning, the minuteſt Leaf would ſtop her, were ſhe unprovided with theſe extended Legs, that raiſe her above the common Verdure, and enable her to purſue her Prey with due Expedition.

The Eggs of Spiders.

But it is not ſufficient to have given you a Deſcription of the ſeveral kinds of Spiders, or at leaſt thoſe who are moſt common; it will be an additional Satisfaction to you, to know how they range their Eggs, and preſerve their Species *. Several People never eat Fruit, becauſe they believe Spiders and other Inſects ſcatter their Eggs upon it at Random; but there is not the leaſt Cauſe for this Apprehenſion. They beſtow more Preparation and Care on theſe Eggs than is generally imagined, and are ſo far from abandoning them to Chance, that they ſpin, for their Reception, a Web five times ſtronger than that wherein they catch Flies. 'Tis a Web they work upon with Pleaſure, and to which they appropriate all the beſt Materials the Profeſſion can furniſh. With this Web they make a Bag, wherein they depoſite their Eggs, and it is incredible to think what Care and Labour they employ for the Preſervation of that Bag.

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* Memoirs de l'Acad. des Sc. M. de Reaumur. 1710.

Chev. Such a Bag as this makes me laugh heartily; but can't you oblige me with the Sight of it?

Prior. 'Tis good not to be too credulous, and therefore if her Ladyſhip pleaſes, we will walk a few Moments by the Box Trees that border this Terraſs: I have beforehand been ſearching upon your Account, and have found what you deſire to ſee. Obſerve in that Box Tree, one of thoſe Spiders who never ſpin a regular Web, like others. Under her ſhe carries a large white Ball, which you would judge to be Part of her Body.

Chev. And is it not her Belly?

Prior. Nothing leſs. Take a Twig and ſhake the Spider a little, to make her drop the Ball.

Chev. 'Tis fallen down and ſhe runs after it.

Prior. This is the Bag of Eggs you was ſo deſirous to ſee: Don't think the Dam will forſake it: Pray obſerve her Behaviour.

Chev. I ſee her roll herſelf over the Ball.

Prior. She does more, for ſhe forces out of her Dugs a clammy Liquor with which ſhe faſtens herſelf anew to it.

Chev. Tis very true; and ſee how ſhe carries it away.

Prior. She will not ſtop here: Her Tenderneſs for her Young will diſcover itſelf by many Sollicitudes. Judge of them by this other Spider, who is of the ſame Species, and whoſe Young are hatched.

Chev. Where are they? I only ſee the Dam.

Prior. Obſerve what ſhe has on her Back.

Chev. All that I can diſcover is ſomething prominent.

Prior. Move gently ſome of the Threads you ſee ſcattered here and there in that Opening, and obſerve what will come out at the Top of the Creature.

Chev. Bleſs me what a pleaſant Sight is here! To my thinking I ſee above a thouſand little Spiders ſkipping down from their Mother, and running along the Threads: Does ſhe carry her whole Family on her Back? What will become of them now?

Prior. Stand ſtill a little: When the Danger is once over, you'll ſee all the Family come together again.

Chev. And there they are indeed, all aſſembled in a little Cluſter on their Mother's Shoulders.

Prior. Here is a Spider of another Species, who lays up her Eggs in a little Purſe like a leathern Cap, which ſhe ſometimes fixes on a Wall, and ſometimes on a Leaf, as ſhe has done here: She never loſes Sight of this precious Depoſite; but continues whole Days and Nights near it: She hatches and warms her Eggs, by conſtantly brooding over them. Pluck off the Leaf, and ſee what will become of the Dam.

Chev. She ſuffers herſelf to be carried away with the Leaf; I am not very fond of ſuch a Neighbour.

Prior. You may kill her ſooner than force her to abandon her Brood; She never quits her Hold till the little Spiders are hatched. But tell me, Sir, what ſee you in that other Opening?

Chev. I perceive two little Bags, or Packets of a reddiſh Colour, ſuſpended by a couple of Threads; and before theſe Bags, I ſee a Pendant of dry Leaves. For what Uſe are theſe Things intended? Is not this Work accidentally formed by the Wind?

Prior. 'Tis a Spider of another Kind, who has there hung up thoſe two Bags, wherein ſhe has treaſured her Eggs.

Chev. But what may be the Uſe of this Bunch of dry Leaves, that ſwings about in the Entrance?

Prior. 'Tis to deceive Paſſengers, and eſpecially Waſps and Birds, who are upon the Watch for the Bag of Eggs. Theſe little Whiſps of dry and reddiſh Leaves is no proper Morſel for the Birds; and then by its perpetual Agitation, it hinders them from diſcovering the Packets that are hid behind.

Chev. Proſperity to the Induſtrious!

Prior. We will not look for any common Spider, to give you an Inſight into her particular Qualities; it is ſufficient to acquaint you, after what you have ſeen, that in general all Spiders wrap their Eggs in a Web whoſe Strength is aſtoniſhing. They commonly faſten the Packet to a Wall. When any Danger appears, their firſt Care is to pull down this Packet, and with it to ſave themſelves where they can. Thus, my dear *Chevalier*, you have my Obſervations on theſe Creatures, without entering into a particular Enumeration of all the Species, whoſe Names, Figure, and Policies, with their manner of weaving, and enſnaring their Prey, are diverſified without End.

Conteſs. We muſt have a Word or two on the Tarantula, for the Species is too extraordinary to be paſs'd over in Silence: This Animal very much reſembles Houſe Spiders, but the Bite of it, eſpecially in hot Countries, produces very fatal and aſtoniſhing Effects. The Poiſon is not immediately perceptible, becauſe its Quantity is too inconſiderable *; but then it ferments and occaſions very frightful Diſorders five or ſix Months afterwards. The Perſon who has been bitten does nothing but laugh and dance, is all Agitation, and aſſumes a Gaiety full of Extravagance, or elſe is ſeized with a black and diſmal Melancholy. At the Return of that Period of the Summer Seaſon when the Bite was given, the Madneſs is renewed, and the diſtempered Party conſtantly talks over the ſame Inconſiſtencies, fancies himſelf a King, or a Shepherd, or whatever you pleaſe, and has no regular Train of Reaſoning. Theſe unhappy Symptoms are ſometimes repeated many Years ſucceſſively, and at laſt end in Death. Thoſe who have been in *Italy* † about *Naples*, tell us, this odd Malady is cured by a Remedy ſtill odder; for according to them, nothing but Muſick, and eſpecially an agreeable and ſprightly Inſtrument, as a Violin, for Inſtance, can give Relief; for which Reaſon they are never without ſuch in this Country. The Muſician endeavours to find out a Tone that may ſeem to bear ſome Proportion to the Temperament and Diſpoſition of the Patient: He repeats his Attempt, and if he touches a Note which makes an Impreſſion on the diſtempered Perſon, the Cure is infallible; The Patient immediately begins to dance, and always riſes and falls according to the Modulation of the Air. In this Manner he continues till he has heated himſelf into a Sweat, which drains off the Venom that torments him, and at laſt gives him effectual Relief. I had this Account from a Friend of ours, who has been Conſul for the *French* Nation at *Naples*, where he aſſured me, he had ſeen Inſtances of People who were bitten and cured in this Manner.

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* Memoirs de l'Academ. des Scienc. 1708.

† *Myſſon*'s Voyage into *Italy*.

Chev. I find Learning ſhines through all this Family, and every Thing I hear in this Place is agreeable, and extraordinary.

Counteſs. You will certainly be ſurprized, and tell me I am very learned, when I diſcourſe with you about my little Chickens, and all the Wonders of my Poultry, for that Subject will come in its Turn —— But I ſee the Count alighting from his Horſe, and he has brought home Abundance of Company. Let us go and receive him.

Chev. I fly to embrace him.

The End of the fourth DIALOGUE.

WASPS.

DIALOGUE V.

The PRIOR, *and*
The CHEVALIER.

Prior. SIR, the Company who came here Yeſterday, have ſome Affairs to diſpatch before they go, and neither the *Count* nor his Lady will be able to wait upon you To-day. As for my Part, I ſhall make you but indifferent amends for this Loſs; but I have a Piece of News to tell you, which perhaps may amuſe you.

Chev. What may that be, Sir?

Prior. Something has been juſt now diſcovered under Ground, which deſerves your Curioſity, the moſt of any thing in the World.

Chev. Is it to be ſeen?

Prior. It is, and this very Day too. ——— The Affair, in ſhort, is this. The *Count* deſired me to entertain you, this Afternoon, with the Changes that happen to Flies of every Species. I employed, myſelf, Yeſterday, in preparing a full Account for you, of all that can be ſaid on this Subject, and was digeſting my Remarks in a little Order, when a Perſon came to acquaint me, that ſome Huſbandmen, who were at work in our Neighbourhood, had found a Curioſity which had filled Numbers who came to ſee it, with Admiration. Upon this I immediately left your Metamorphoſes, and went, like other People, to take a View of it, and really the Thing deſerved it; for they had found an entire City buried in the Earth, and ſuch a City as was capable of lodging between eleven and twelve Thouſand Inhabitants. The Structure of this City was perfectly ingenious, tho' very different from ours: The Wall is not a ſimple Incloſure ſurrounding the Place, but a great Dome that entirely covers and encompaſſes it on every Part. After they had carefully ſurveyed it, they could only diſcover two Gates; and as the Darkneſs was very great under this Dome, they had demoliſhed Part of it to have a clear Proſpect into the different Quarters of the City. But here another Scene of Aſtoniſhment open'd: The Streets are not ranged like ours, in Side Lines, but piled over each other in different Stories, which are ſeparated by ſeveral Ranks of Columns; ſo that they are rather Porticos than Streets; the Uppermoſt of which riſes on the Second, the Second on the Third, and ſo in Succeſſion, reckoning downwards. The Houſes are of equal Dimenſions, and thick ſet againſt one another in the Subſtance of the Vault. All the Buildings compoſe one and the ſame Order, and are likewiſe on a Level in each Story, and covered with a flat Terraſs, or common Roof, made with a very binding Gum, and as ſmooth as a Marble Pavement: Here the Inhabitants walk between the Pillars, that ſupport another Vault with its Range of Houſes. There are eleven of theſe Porticos, or Vaults, all of the ſame Structure, and raiſed with the niceſt Symmetry, and Correctneſs of Deſign: 'Tis the Obſcurity alone that disfigures the Work; I did not ſo much as ſee the Remains of any Lanthorn, or other Contrivance to illuminate the City.

Chev. A very ſtrange Place to live in, ſurely!

Prior. You believe, Sir, that I am deſcribing to you ſome City built before the Flood, and which afterwards ſunk, and remained buried under Ground.

Chev. I don't know what to think.

Prior. Indeed 'tis a very ſurpriſing Affair; for this City was built only by a ſwarm of Waſps.

Chev. How! Is it no more than that?

Prior. No more than that? — Had this City been even built by Men, there would have been no Occaſion to exclaim againſt it; but it is altogether aſtoniſhing, that a great Dome, with Porticos and Columns; in a Word, that an entire City ſhould be founded by Waſps.

Chev. Let us ſee this Neſt of Waſps then: We ſhall be diverted with it.

Prior. It is in that Arbour, and I imagined it would be more entertaining to you than a ſerious Diſſertation on Inſects. I have preſerved it almoſt entire, for there is only a little Hole made in one of the Sides, to afford a Proſpect of what is within: Step in and look at it: You will find the whole City placed on a Bench.

Chev. Oh! Sir, what a delightful Work is here! I ſee every thing as you have repreſented. Here are the Pillars, the Stories, Houſes, and Cupola. But how could you get this Neſt, and where was it found.

Prior. I perceived the Number of my Bees, and my Quantity of Honey ſenſibly diminiſhed, and ſuſpected that ſome Waſps Neſt in the Neighbourhood, was the Source of this Miſchief; and accordingly I ordered it to be deſtroyed, if it could be found. It was diſcovered at laſt, and Yeſterday in the Evening they ſtormed it with Fire and Sulphur. When they had begun to open the Ground at the Waſps Hole, in order to force them out, and burn them in their Paſſage, I was told they had found a large Pannier, made almoſt like a Gourd. I knew what it was, and immediately determined to preſerve it, that you might have a Sight of it. This is the City then, that I have been deſcribing. But no more of the Terms, City, Colonnades and Architecture: Let us talk of Things ſimply as they are; there is ſtill enough of the Marvellous to charm you; I ſpeak of the Marvellous unmixed with Falſhood; that Marvellous which good Senſe demands, and is individually the very Thing you love.

Chev. What is the Original of Waſps, and how do they raiſe their Building?

Prior, The Waſps who inhabited this Pannier are of three Sorts *: Firſt, the Females who are large, and originally very inconſiderable in Number: Secondly, the Males who are almoſt as big, but more numerous: Thirdly, the Mules (if I may ſo expreſs myſelf) that is to ſay, Waſps who are conſigned to the moſt laborious Employ-

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* Memoirs de l'Acad. des Scienc. M. de Reaumur. 1719.

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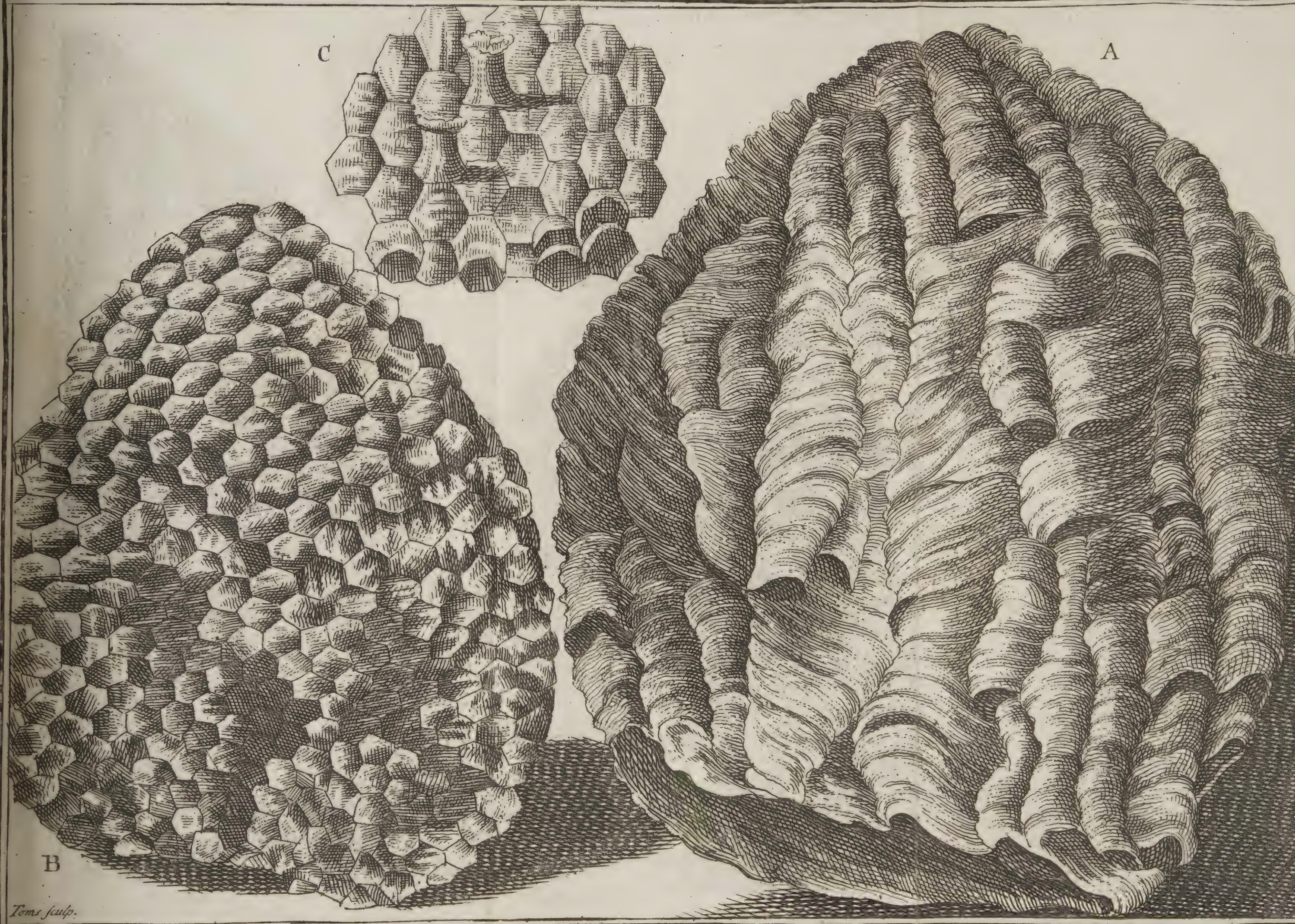
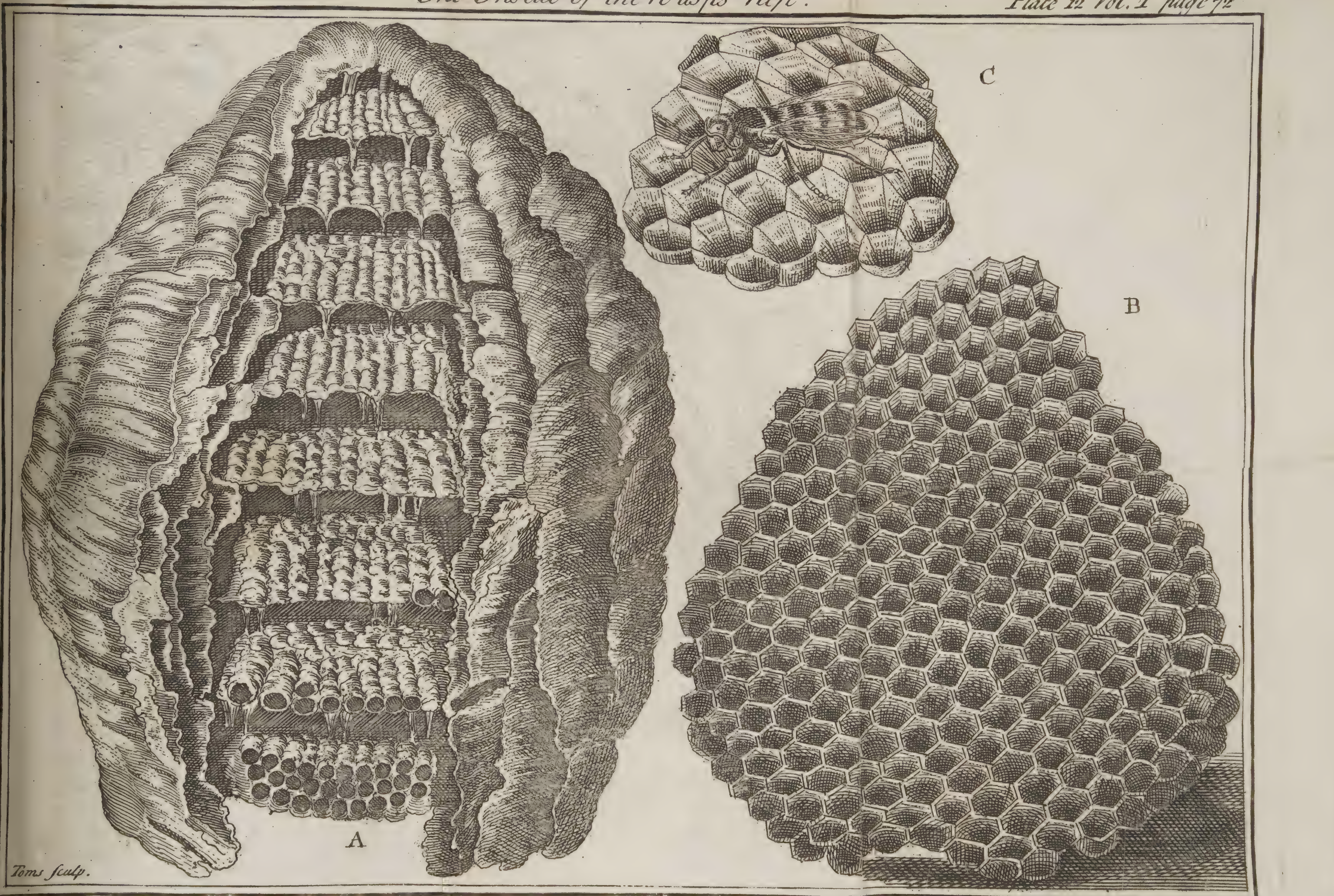
The Outward View of the large Waſps Neſt.

Plate II Vol: I page 72



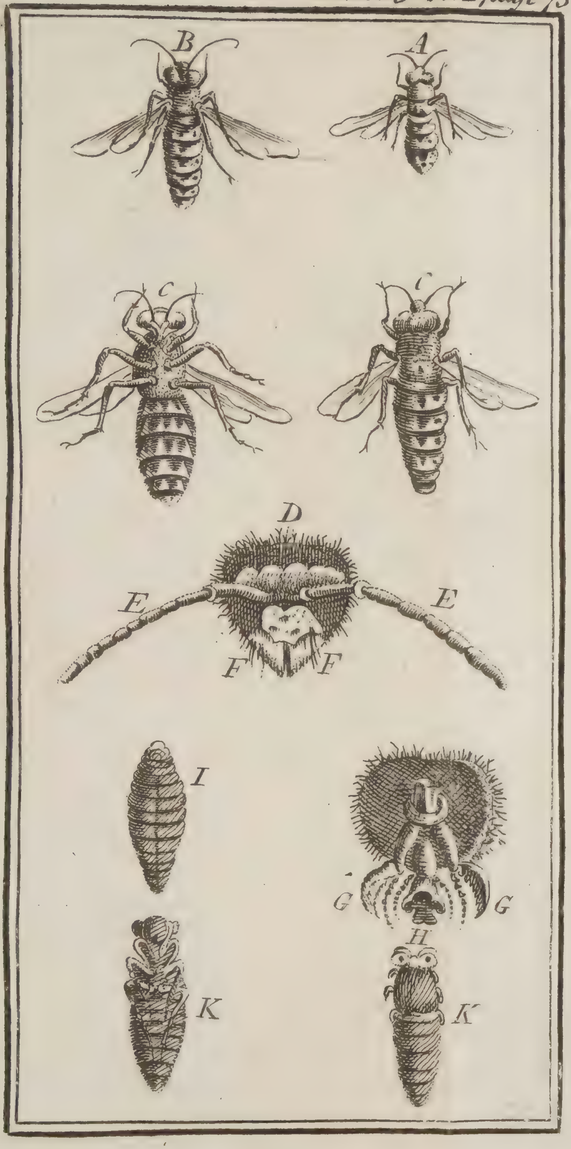
A. *The Circumference of a Neſt, in the manner it is built by large Wasps, in Timber-Yards, or other places but little frequented.* B. *the Upper part of one of the Stages.* C. *Part of a Cake or one Range of Cells, where the Top of theſe is exhibited to view in their natural Dimensions.*

The Inſide of the Wasps Neſt. Plate 12 Vol. I page 72



A The Neſt yͤ Fore part of which is broken down, to exhibit yͤ inſide with its Ranges of Cells & Columns to view. B the inſide view of yͤ Cells in one Range. C yͤ ſame Cells in their natural Dimensions. Thoſe in yͤ four upper Rangers are narrower by a fourth becauſe they are calculated for yͤ Reception of yͤ Eggs that produce yͤ Mule Waſps, who are ſmaller than yͤ Males & Females.

Plate 13 Vol. I page 73



Waſps.

ments, and are neither Males, nor Females: Theſe are much ſmaller, but vaſtly numerous, and are the Commonalty of the Nation. There are alſo three Sorts of Labours wherein the Waſps are employed: Firſt, the building of the Neſt; ſecondly, the providing of Food; and, thirdly, the laying of Eggs, and Nouriſhment of their Young.

The Hive.

As to the Structure of the Hive, they firſt chuſe about *Midſummer*, a ſubterranean Cavity begun by Field Mice, or Moles, or elſe they dig one themſelves, and uſually on a riſing Ground, that the Water may flow down below their Place of Reſidence, and not be incommodious to them. When they have choſen a Situation, they begin to work with amazing Induſtry; they ſcoop out the Earth, and even carry it to a conſiderable Diſtance. Their Activity muſt be very great, ſince, in the Space of a few Days, they build under Ground, an Habitation above a Foot high, and as much in Breadth. Whilſt ſome are digging, others are in the Fields, ſeeking Materials for the Edifice. In Proportion to their caſting out the Earth, they ſtrengthen the Roof, and prevents its falling in, by cementing it with Glew; they then affix it to the Foundation of their Building, which they continue to finiſh downwards, as if they would make a Bell, and cloſe it at the Bottom.

Chev. How are they able to remove and throw out the Earth? I can hardly comprehend that Flies ſhould be capable to ſink themſelves a Dwelling ſo deep.

Their Tools.

Prior. They are provided with excellent Tools for that Purpoſe: Out of their Mouth a Trunk extends, near which are two little Saws that play againſt each other to the Right and Left. Beſides theſe, they have two large Horns and ſix Feet. I don't know whether they employ their Trunk or not, upon this Occaſion; but they firſt, with their Saws, cut the Earth into little Particles, and carry it away with their Paws.

Chev. I have a particular Curioſity to know what Materials compoſe this Building.

The Materials of the Neſts.

Prior. They are only Wood, and Glew; The Mule Waſps are diſpatched to cut the former out of the Frames of Windows, Lattices of Arbours, and Extremities of the Roofs of Houſes; they ſaw and carry off a vaſt Number of minute Shivers; and when they have hacked them very ſmall, amaſs little Heaps with their Paws, and pour in a few Drops of a glutinous Liquor, by the Aid of which they knead the whole into a Paſte, and then round it into a Ball. At their Return home, they place the Ball upon that Part of the Building, which they would either lengthen, or make thicker: They ſpread it out with their Trunk and Paws, going backward all the way. When the Ball is reduced to a level Surface, the Waſp returns to his firſt Stand, where he began to ſpread the Paſte. He then preſſes and ſpreads it anew, and always with a retrograde Motion of the Body, 'till he arrives at the oppoſite Side; and when he has repeated this Operation two or three times, this pliable Compoſition of Wood and Glew becomes a ſmall Leaf, of a grey Colour, but ſo exceeding thin, that the fineſt of our Paper is not at all comparable to it. The Mule Waſp having compleated his Work, on this firſt Ball, returns to the Fields for more, which he ſtill forms into Leaves, and lays them one over another. Some of his Fellow-Labourers place new ones on the former, and all theſe Leaves, thus joined and cemented with the ſame Glew, form the grand Cupola which bends over the whole Habitation. The Cells and Columns are made with the ſame Materials.

The manner of building it.

Chev. If I can judge by my Touch, the Columns are extremely hard, and much more ſo than the Dome.

Prior. Your Obſervation is juſt; and it is very certain they are particularly careful to harden thoſe Columns I don't know whether the Matter be more compact and tenacious, or whether they cement it with a larger Quantity of Glew; but it is very natural, that what ſuſtains the Pile ſhould have the moſt Solidity.

The Columns.

Chev. Can you acquaint me, Sir, why theſe little Pillars have larger Dimenſions in the two Extremes, where they touch the upper and lower Stories?

Prior. The Materials are ſpared, with a prudent Frugality, in the Shaft of the Pillar, but it cou'd neither ſupport itſelf on its Baſis, nor ſuſtain its Architrave, without being well fixed and glewed at the Points of Contact. 'Tis for this Reaſon the two Extremities were ſwelled, that they might cover a larger Surface, as it is certain that a greater Circumference of Glew has a more ſerviceable Effect at the Bottom and Top, I had almoſt ſaid the Baſe and Capital.

Chev. There is a great deal of Judgment in all this: But what is the Meaning of theſe two Openings?

The Doors.

Prior. One is a Paſſage into the Edifice, and the other leads out of it: through the firſt of theſe ſuch Waſps enter who are charged with Burdens; thoſe who are going to the Fields, paſs out at the other, and, by this Contrivance, they have no Interruption in their Motions.

The Stories.

Chev. I ſee they have a free Paſſage under theſe different Stories, and may enter into which Manſion they pleaſe. All the Doors of which are open below, except ſome, that I obſerve are cloſed up with a ſort of Parchment: But here are ſeveral others too, that I find ſhut up in the ſame Manner.

Prior. I will acquaint you with the Reaſon of this in a few Words; but firſt I deſire you to count the Stories, that you ſee raiſed one above another, like a Pile of Cakes.

Chev. I count eleven; but this at the Top is very ſmall, and ſo is that at the Bottom; and they grow larger towards the Middle of the Pannier.

The Cells.

Prior. The moſt remarkable Circumſtance is, that one ſhould ſee whole Cakes compoſed of ſpacious Apartments, and others parcelled out into ſuch as are very ſcanty. The large Cells are appropriated to receive the Eggs, which are to produce Males and Females; the narrow Lodges are to contain the Eggs out of which the Mules, who are by much the ſmalleſt, are to proceed. Our Architects are not miſtaken in their Proportions, and the Mothers of Families never depoſite in a Mule's Lodge, any Egg, impregnated with a Male or Female. The Lodges of the Mules are between ſeven and eight twelfths of an Inch in length, and about two twelfths of an Inch, or more, in breadth: the Cells of the reſt are about eight twelfths of an Inch in

Depth, and ſomething more than three in breadth; the Columns may be ſix twelfths of an Inch in height.

Chev. I diſcover thirty nine or forty Columns between one Story and another.

Prior. You will ſometimes find more; but at preſent obſerve the Regularity of the Cells; they are all Hexagonal, which, in every Reſpect, is the moſt commodious Figure for a Range of Cells, where there are no Vacuities; were they round, they would only touch one another in a ſingle Point, and the void Interval would have been quite loſt; had they been triangular or ſquare, they might certainly have been very well connected together; but then the Angles within would have been loſt, becauſe the Animal, for whoſe Habitation they were intended, is round. Hexagons approach the neareſt to a circular Figure, and have all their Sides exactly adhering to each other, ſo that there is no uſeleſs or unneceſſary Vacancy between them, and every Lodge, weak as it is, becomes fixed and ſolid by its Coincidence with others.

Chev. Believe me, Sir, the fineſt Palace would not aſtoniſh me ſo much as the Regularity of theſe minute Apartments: But let us now proceed to the Food of Waſps; for I ſee you are perfectly acquainted with every Particular in this little Nation.

Prior. I forgive them all the Injuries I ever received from them, and the Honey of which they have robbed me, for the Sake of the Pleaſure I have had in ſtudying their Manner of ſubſiſting. They love to lodge themſelves in the Neighbourhood of Bees, Vineyards, and the beſt Garden Vines, and have a particular Fondneſs for a Kitchen; where they meet with Proviſions already prepared. The Mule-Waſps, and even the Males, range the Fields for Prey; they expatiate every where with Intrepidity, and venture into the very Hives of Bees, who are ſometimes much embarraſſed to defend themſelves from their Invaſions. When there is no Honey to be found, they fall upon the beſt Fruits, and are never miſtaken in their Choice: The Apricot, for Inſtance, is very palatable to them; 'tis the ſame with the Bon-Chretien, and other delicate Pears; the ruddieſt Peaches, and the ripeſt Grapes, eſpecially the Muſcadine, are their uſual Food, according to the Seaſon; but for all this, they are not over dainty, for at other Times they can ſubmit to any Diet. Nothing comes amiſs to them in a Kitchen; they can take up with Fowl, Bacon, or even Butcher's Meat, and are not ſo nice as to deſpiſe any thing. If they light on the Shambles in their Way, they immediately look to the material Point, and have no Thoughts of proceeding farther: Here they fall to work, and carry off Bits of Fleſh, as big as themſelves, to their Neſt, where the Females diſtribute their Proviſion among their little Offspring. The Butchers, who have Diſcretion enough to underſtand their own Intereſt, accommodate the Matter with them, and very hoſpitably preſent them with a Piece of Neat's, or Calf's Liver. This they faſten upon preferably to any other Food that has Fibres, which are too long and difficult for them to cut through. But it is not only to divert them from other Meat, that the Butchers compound the Matter with them at this Expence; they derive a great Advantage from this Proceeding, and are not at all diſſatisfied with the Viſits they receive from the Waſps; for whilſt theſe Creatures are regaling themſelves with the Liver, there is no Reaſon to fear that any Fly, or other Inſect, will approach the Place, and make Depredations on the Meat, becauſe the Waſps keep Centry, and chace them without giving any Quarter; and the Fly would be very daring, that ſhould then preſume to make its Appearance: The worſt that can happen is this; the Waſps may, here and there, mangle ſome other Proviſions at their own Diſcretion, but the Inconvenience is not very conſiderable, becauſe this Animal defiles nothing, the Female always confining herſelf to the Hive with her Eggs; whereas the Fly is very ſedulous to lay her own in ſome Piece of Meat, or other, which is very prejudicial to the Butchers.

Chev. I am extremely pleaſed with Waſps, and pe ceive they are very ingenuous Creatures.

Prior. I find their Induſtry and Neatneſs make you prejudiced in their Favour, but I muſt tell you the whole Truth: They deſtroy all the Merit of theſe plauſible Quaities, by others that are very pernicious. They are exceedingly rapacious and cruel, and, if I may uſe the Expreſſion, are mere Pirates and Cannibals to the Nation of Bees; not ſatisfied with ſtealing Honey, they murder the very Makers; they ſeize, they cruſh, they kill, nay, they even devour their Enemies: This is far from being an amiable Behaviour. But, without excuſing them, I may venture to ſay, that in theſe Particulars, they reſemble great Numbers of our own Species, and even our *Europeans* themſelves. The Waſps plunder and devour other Flies. 'Tis the very ſame with us: How many Men are Waſps in the higheſt Degree, with reſpect to their Fellow Creatures? The Difference is, that Waſps are voracious by a natural Inſtinct that impels them; whereas Man is a Malefactor by Choice, and in Oppoſition to the Dictates of Reaſon that enlightens him. We may add, that the Neceſſity Waſps are under of conſtantly providing for a numerous Family, in ſome Meaſure excuſes their Avidity. But to proceed: The Diſtribution of the Food is made with a great deal of Exactneſs; the Mothers are charged with this Care, and are ſometimes aſſiſted by the Mule-Waſps.

The firſt Thing diſcoverable, at the Bottom of each Cell; is a little Egg faſten'd with a viſcous Subſtance, to preſerve it from falling. Into this Cell one may ſee the Dam frequently enter, who apparently communicates a genial Warmth to the Egg in order to facilitate the Birth. From this Egg proceeds a little Worm, which the Parent carefully nouriſhes, and which by degrees increaſes in Bulk, and thrives very ſucceſsfully, filling the whole Apartment with the Roundneſs of its Form. The Mother after ſhe has received and divided the Proviſion brought to her by the Mules, goes from Chamber to Chamber, diſtributing Portions of it with her Mouth to each Worm, in its Turn, and all this with the greateſt Equality, except only, that her Supplies are more frequently imparted to the large Worms, who are to produce the Males and Females. Turn up the Hive, Sir, and look into the Entrance of theſe Cells. — What do you diſcover there?

Chev. I ſee the large Worms you mention. Here is one who opens its Mouth, and takes my Finger for its Dam.

Prior. He has been neglected ever ſince Yeſterday, and without doubt, has a pretty good Appetite.

Chev. But a great many of the Cells are ſtopped up.

The Nymphs.

Prior. The Affair is this: All theſe Worms, after a certain Period, ceaſe to be burdenſome to their Mothers. They leave off eating, and will receive no more Suſtenance. 'Tis then they begin to employ their Mouths in ſpinning a very fine Silk, one end of which they glew to the Opening into their Apartment, and then winding their Head from Side to Side, they faſten it to different Places; and by Virtue of their repeated Motions, form with the Silk, that continually lengthens, a Kind of light Stuff, that ſerves to cloſe up the Paſſage. In this Retirement, they diveſt themſelves of their Skin, the Worm dies, her Spoil falls to the Bottom of the Cell, and nothing now remains but a white Nymph, who gradually diſengages her Feet and Wings, and inſenſibly acquires the Form and Complexion of a perfect Waſp. Break ſome of theſe Partitions, and you will ſee her, as it were, ſwaddled up, and only exhibiting to view, an imperfect Sketch of the delicate Limbs of the ſucceeding Animal, who gently fortifies himſelf in the little Manſion which protects him from Danger, till his Feet are all unfolded, and then he breaks through the Partition that ſhuts him up. I am now going to ſhew you this: Here, Sir, is a Worm changed into a Nymph.

Chev. What an agreeable Figure it makes with its extended Chin bending back, and the Paws join'd together.

Prior. Some Inſects continue whole Years in this State of Nymphs, but the Waſp is not confined to it above twelve, or fifteen Days at moſt; after which, finding himſelf equipp'd with all his Furniture, he demoliſhes the Door of his Cell. You may then ſee him extend, firſt one Horn, and then another; to theſe a Paw ſucceeds, the Head grows viſible next, and the Aperture widens with the Efforts of the Inſect's Body, till at laſt he comes out a compleat Waſp; whoſe firſt Employment is to wipe off the Humidity from his little Wings, with his hind Feet, which bruſh them for ſome Time; after which, he ſprings immediately into the Air, and flies to the Fields to pillage with the reſt of his Species, whoſe Addreſs and Malignity he begins to imitate from that Day.

Chev. How! without any Apprenticeſhip?

Prior. Moſt certainly. —— As for the Mule Waſp, it falls to plundering the Moment it leaves its Retreat. The Male, when he quits his, paſſes away ſome Time in ſporting, and then goes to make his Court to the Queen of that Quarter. But as ſoon as ever the Female makes her Appearance, ſhe is buſied with the Management of her Family.

Chev. I find the Mother has a very agreeable Time of it in this Country; but I can't help pitying the poor Mules, who are charged with the Weight and Fatigue of all the Work.

Prior. It's true, the Mothers are well treated; they have the beſt of the Proviſions, and are ſerved with the greateſt Aſſiduity and Reſpect. Nothing can equal the Politeneſs of their Conſorts, and indeed of the whole Tribe. But then the Number of theſe Mothers is very inconſiderable, and they have a prodigious Family to manage. When you conſider the Quantity of Eggs they are to lay, the Multitude of Young they muſt nouriſh, the Neceſſity they are under of perpetually going from Cell to Cell, and from one Story to another, to viſit and give Satisfaction to each Individual; to be eternally repeating the ſame Labour, and, what is worſe, to be conſtantly confined at home; I ſay, when you conſider all this, you will agree, that a Mother-Waſp is in a very indifferent Situation. As for the Mules you are ſo compaſſionate to, their Condition is much more eligible; they wing the Air in queſt of Food, they pillage, they eat, and ſleep without the leaſt Anxiety, and are certainly the Happieſt of all the Clan.

Chev. Do the Waſps, Sir, make any Proviſion for the Winter?

Prior. They don't ſo much as *take Thought for the Morrow.*

Chev. How are they able then to paſs that long and uncomfortable Seaſon?

Prior. At the Approach of Winter every Thing changes in this Republic: When the firſt Colds begin to be felt, the Females and their Conſorts, who till then were ſo tenderly affected towards their Young, deſtroy the whole Offspring; Eggs, Worms, Nymphs, complete Waſps, all are

Their Severity.

are involved in the common Deſolation; they caſt every thing out of the Hive, and leave the very Cells in Ruins.

Chev. What can occaſion this Change, and inſpire them with ſo much Fury?

Prior. 'Tis becauſe they are ſenſible they have no more Time allotted them to bring their Embrios to Perfection, and therefore reſolve to charge themſelves no longer with an unavailing Care. When the Sun ſhines, they ſometimes take the Air, but Joy and Alacrity ceaſes among them; they all languiſh and diſperſe; they ſhrink from the Cold, and endeavour to ſhroud themſelves as commodiouſly as they can. Thoſe who continue in the Hive, paſs the Winter there without either having, or ſeeking any Suſtenance. They are either benummed, or killed by the Froſt, and ſometimes out of eight or nine Thouſand Waſps, or a much greater Number, that inhabited the Hive, only two or three Dams ſurvive.

Chev. How can the Species then be preſerved?

The Fecundity of Female Waſps.

Prior. The Mothers are the moſt vigorous and their Bodies the beſt adapted to reſiſt the Cold. Could you believe one Female Waſp ſhould be ſufficient to produce a whole Swarm the enſuing Year? She builds two or three Cells, that form a Kind of little Cluſter, glew'd by the Stalk to the Top of the Cavity, ſhe has either dug or found. There ſhe lays and hatches a couple of Mule Eggs, and ſeeks for Food to ſupport the Young. The whole Care lyes upon her, as you obſerve. The two Worms ſatiate themſelves with eating, after which they ſpin for ſome Days, and then cloſe up the Entrance into their Cells. You ſee there are two young Waſps already in Being. The Parent being now diſcharged from the Care of their Maintenance, forms two other Cells, and whilſt each of the new Eggs ſhe has laid are Hatching, and the Young coming afterwards to Maturity, the firſt Mule Waſps break out of their Confinement, and begin to work with the Mother Inſect; and now there are three in Company. Fifteen Days after which, the ſecond Brood adds to the Number; they increaſe, and begin to enjoy all the Advantages of Society. They accommodate themſelves with a large and commodious Apartment. The little Cluſter of Cells is daily augmenting; and then the Mother lays firſt a Male, and then a Female Egg. You would imagine ſhe did all this by Injunction, ſince ſhe adjuſts the Dimenſions of the Lodge to the Size of the Male or Female who is to be born. The Male becomes a Huſband, and the Female a Mother. If there are two Mothers in the Month of *June*, there will be fifty within three Weeks afterwards, and theſe fifty will produce above ten Thouſand Waſps before the Month of *October*.

This, Sir, is what I had to obſerve upon the Article of Waſps. It is not material for me to entertain you with any other Species of theſe Inſects, ſome of which hang their Neſts on the Branches of Trees; and others, who are ſometimes twice as large as the common Sort, build their Neſt under a Roof, or in a Pile of Timber. The Induſtry and Prudence of each Species is much the ſame, and you may form a Judgment of the Works of theſe laſt, by what I have related of common Waſps, whoſe Conduct I have had better Opportunities of obſerving. But that which, above all, I am never weary of admiring, in all theſe Species, is the Variety and Juſtneſs of the Means, by which Providence arrays, feeds, and defends every Claſs.

Chev. But you have told me nothing, Sir, of the Sting of a Waſp: Are they not provided with one?

Prior. Not provided with one! —— Yes, I am but too ſenſible of it to my Coſt, and have felt it more than once: I aſſure you I have ſmarted pretty handſomely, before I could make the Diſcoveries I have imparted to you; but I would willingly be expoſed to greater Hazards, provided they would enable me to teach you any uſeful Knowledge in an agreeable Manner.

Chev. It is not reaſonable that I ſhould have all the Pleaſure, and you the Pain.

Prior. Pardon me, Sir, nothing is more conſiſtent. It is but reaſonable that Thorns and Stings ſhould fall to the Lot of him who undertakes to teach others, and that Pleaſure alone ſhould be the Share of thoſe who are willing to learn.

Chev. I think myſelf exceedingly happy in ſuch Hands.

And now, Sir, ſhall we make a Tranſition from Waſps to Bees?

Prior. I ſhall do it with Pleaſure; and, in explaining to you the Structure of a Bees Sting, ſhall ſufficiently deſcribe that of a Waſp, which is the very ſame. But we muſt defer this Subject till to morrow, for at preſent 'tis impoſſible for me to enter upon it; becauſe I ſee ſome People waiting for me. I am really a Servant to my Pariſhioners, and tho' I have an uncommon Pleaſure in your Company, I am yet obliged at preſent to take my Leave.

The End of the fifth DIALOGUE.

B E E S.

DIALOGUE VI.

The COUNT, *and* COUNTESS.
The PRIOR, *and*
The CHEVALIER.

Counteſs. WE have at laſt diſengaged ourſelves, Sir, from the Company who interrupted our Converſations; and the *Prior* has ſent to acquaint us, he will be here immediately. In the mean Time, may we know what your Converſation turned upon Yeſterday.

Chev. Inſtead of entertaining me with a long Diſcourſe on the various Conditions and Employments of Waſps, the *Prior* brought me an entire Neſt of thoſe Creatures; he ſhewed me an Incloſure filled with ſeveral Ranks of Stories, and a Number of Apartments, ſome quite open, in which there was only one Egg, or a living Worm, others were cloſed up, and lodged the Nymphs that were ready to become perfect Waſps. Others had their Doors begun to be broken down, out of which I ſaw a beautiful Waſp iſſue, as I was carrying the Neſt, the *Prior* preſented me with, to my Chamber. I intend to have a Box made on purpoſe to preſerve it.

Count. Take care, however, to expoſe it, for ſome Days, in the warmeſt Sun ſhine, or even at the Fire, to deſtroy the Inſects that may ſtill be living there. I need not give you a Reaſon for this Precaution. As to the reſt, I am very glad you have an Idea of the Labours of a Waſp, ſince it will make you more eaſily comprehend our Account of Bees.

Chev. I ſee the *Prior* coming up to our Arbour. What does he carry under his Arm? I fancy you'll find it another Preſent for me.

Counteſs. He certainly brings you ſome new Eſſay, capable of ocular Demoſtration. 'Tis no leſs than a Honey-Comb.

Chev. That is what I have never ſeen. It is a happy Thing to have to do with the *Prior*, for one immediately finds every Wiſh gratified.

Prior. I had no occaſion, Sir, to go very far for what I have brought; it was all at my own Houſe.

Count. Let us be ſeated then: Our Converſation muſt now turn on a very important Subject; we are going to engage in Politics, and the Government of States.

Prior. Our Diſcourſe muſt be a little diverſified, and ſet off with an Air of Dignity. I Yeſterday entertained the *Chevalier* with nothing but Robberies and Murders, but we will talk to-day of publick Welfare, Colonies, Oeconomy, Policy, and Application to Labour; for all theſe make up the diſtinguiſhing Character of the Nation of Bees. Whatever can be ſaid on the Subject of theſe Creatures, may be reduced to two Claſſes; one comprehends the Particulars which are obvious to all the World, and familiar to the Peaſants themſelves; for which Reaſon I ſhall not put the *Count* to the Trouble of giving us a Detail of theſe. The other contains Points of much greater Curioſity, which cannot be known without the Aid of a Glaſs Hive, and Philoſophic Eyes. His Lordſhip, who is very well provided with both, will take upon him the Province of inſtructing us.

Chev. Is it true, Sir, that the Bees have a King?

Prior. You may certainly diſtinguiſh three ſorts of Bees in a Hive[*]. The firſt are the common Species who make up the Populace; are charged with all the Work, and ſeem to be neither Male nor Female. They are all furniſhed with a Trunk for their Labours, and a Sting for their

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[*] Memoirs de l'Acad. des Scienc. 1712. M. Maraldi. Leuwenhoek's Arcan. Nat. Tom. iii. Ep. 135.

Defence. The ſecond ſort are the Drones, who are of a more duſky Complexion, and bigger than the Bees by one third, tho' ſome indeed have been found of the ſame Size with theſe. The Drones have been thought to be the Males, and beſide this, they have no Sting. Above an hundred of this Species have been found in a little Hive of ſeven or eight thouſand Bees *, but the Number is three or four times as great, in a large Hive of ſeventeen or eighteen thouſand. There is likewiſe a third ſort, much more vigorous and long than the Drones themſelves, and who are armed with a Sting like the Generality of Bees †. It is thought there is but one of theſe in each Hive, or at leaſt but one in every Swarm or Colony of young Bees, who, from time to time, are detach'd from the Hive, and go to fix themſelves in another Situation. Whether we ought, with the Ancients, to call this large Bee the King; or, with the Moderns, give it the Title of Queen, I leave the *Count* to determine.

Count. By the Aſſiſtance of a Glaſs Hive, I ordered to be made for my Uſe, I have obſerved very diſtinctly, the three Claſſes of Bees the *Prior* has been deſcribing, and have frequently ſeen the large Bee, who is dignified with the Title of King, marching from Chamber to Chamber.

The Queen.

There was nothing at the Bottom of the Cell, before the Inſect ſheathed the Extremity of his Body in the Cavity; but when it retired, I obſerved an Egg left behind: From whence 'tis natural to conclude this Bee to be Female. And as I have often taken Notice, that in a whole Swarm, there was generally but one of this Species, who indeed is very remarkable, tho' there are ſometimes two, but never more than three, I thought it more proper to call her the Queen. However, I would not diſagree with any one who entertains a different Opinion. But what are the *Prior*'s Sentiments about thoſe large Bees they call Drones? They are not Foreigners, becauſe I have ſeen them born in Cells prepared for their Reception, and which are larger than the others. What then is their Province? Shall we aſſign them to the Queen as her Conſorts? My Hive, has not, as yet, furniſhed me with Diſcoveries on that Point, that are altogether ſatisfactory.

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* Maraldi.

† Leuwenhoek, Arcan. Nat. Tom. iii. Ep. 135.

Prior. All that I know, my Lord, of Drones, is this; they have a Bag of Honey in their Bellies, like other Bees; with this Difference, that the Bees have their Bag continued by a little Canal to their Neck, by means of which they diſcharge the Honey into general Magazines. And when you preſs a Bee never ſo lightly, the Honey immediately evacuates thro' this Paſſage, which is not the Caſe with the Drone. That Creature eats, and retains all for its own Benefit, and contributes nothing to the common Stock. It lives in Plenty, and never works, or wanders in the Fields; but at the moſt, only takes the Air, and walks in full Liberty round the Hive: it has no Sting, and the Reaſon why Nature did not arm it with one is evident: It has no Enemy to fear. As to the reſt, I cannot perſuade myſelf, that a Nation ſo remarkable for Oeconomy, would permit ſuch indolent Companions to dwell among them, unleſs they were neceſſary in ſome Particular. Some have ſuſpected that their Province is to ſupply the Queen with Iſſue, or, in other Terms, to people the State with Subjects.

The Males.

Count. There is ſomething more to be obſerved: By the Anatomy that has been made of them, ſome have thought they have diſcovered in their Structure, that they were the Authors of Generation. I have endeavoured all I could to obſerve in my tranſparent Hive, what Character the Drones maintained with reſpect to the Queen; and this is all the Diſcovery I was capable of making. The Queen keeps herſelf retired in the upper Apartments of the Comb, and which if you pleaſe, we will call her Palace. She very ſeldom appears in public, and whenever ſhe ſhews herſelf, you will always ſee her march with a ſedate and majeſtick Air. You ſmile, *Chevalier*, but the Matter is quite otherwiſe. She never walks alone, and if ſhe is not attended by the whole Swarm, ſhe is at leaſt followed by ſeveral large Bees, who are probably the Drones that form her Court. As the Sovereign takes her Walk but very rarely, and as theſe apparently tend to the general Welfare, whenever they happen, a great Feſtival is celebrated thro' all the Dominions; the whole Nation comes abroad, and every Subject is all Tranſport; and, in order to give her a ſolemn Reception, the Bees hang upon one another with their Paws, and, in leſs than a Moment, form a large Veil, behind which 'tis impoſſible to diſcover any thing that paſſes. This Veil, if you pleaſe, ſhall be a Suit of Tapeſtry, hung in honour to the Queen's Progreſs, or elſe a Curtain drawn by the Domeſticks before her ——

Prior. Your Lordſhip aſcribes to them very noble, or, at leaſt, very modeſt Intentions.

Chev. Is not this Ceremony, a Dance occaſioned by the Feſtival?

Counteſs. A Dance! for my Part I don't know, but am ſure it is the laſt Thing the *Prior* would admit; for he is not very favourable to that Diverſion.

Count. As to the reſt, whatever may be the Intention of theſe Creatures, in hanging thus together by their Paws, and forming themſelves into a Chorus at the Approach of their Sovereign, the Fact is inconteſtable; and I have afterwards obſerved, that the Queen proceeded from Chamber to Chamber, and in each of them depoſited an Egg, after ſhe had privately examined whether each Apartment was empty; and whilſt ſhe ſunk the Extremity of her Body into any Cell, the Drones of her Court ranged themſelves in a Circle round her, and turning their Faces to the Queen, fluttered their Wings, and ſeemed to celebrate the Nativity of this new Progeny. She peoples ten, twelve, and ſometimes more Cells at each Fecundation; and is, herſelf, prolifick enough to give Birth to ſix or ſeven thouſand Young: In the ſpace of twelve Months, ſhe can ſee her Children's Children, by the Inſtrumentality of two or three other Bees like herſelf, and is, in one Summer, the Anceſtor of eighteen thouſand Deſcendants.

Prior. What ſeems to compleat the Proof that theſe Drones are ſo many Stallions, deſtined only to multiply their Species, is this; they are liberally provided for the whole Summer, but when the Queens have diſcharged their Swarms, and at the Approach of Autumn, it begins to be foreſeen, that there will neither be Time nor Warmth ſufficient to rear a new Family, then the Drones are perſecuted and expelled; ſince they are found to be chargeable to the Community, where they only conſume the Proviſions. The Bees no longer allow them to continue in the Hive. Their Averſion extends even to the young Drones; they eject them from their Cells, and firſt kill, and then caſt them out of the Hive, and after this purſue their Fathers. 'Tis to no Purpoſe for them to be deſirous of ſtaying there; the Bees ſeize them by the Wings and Shoulders, they juſtle and fatigue them, and, without the leaſt Remorſe, baniſh every Individual, except perhaps a very few, and even thoſe of a leſs rapacious Species, whoſe Expences are a little more ſupportable. Theſe are reſerved for the Neceſſities of the enſuing Year; which I the rather remark, becauſe the Queen renews her Pregnancy in the Spring; tho' one ſometimes ſees among them only thoſe Drones, who, in their Shape and Dimenſions, differ very little from common Bees?

Chev. And what becomes of theſe poor Drones? they give me a great deal of Concern.

Prior. Rains, Birds and Famine are their Deſtruction, and the Ground near the Hive is covered with their Carcaſſes.

Counteſs. I find the Huſbands make no very agreeble Figure in this Country.

The Maxim is, that the general Welfare ſhould be the firſt Law of the State.

Prior. The Bees don't think themſelves under any Obligation to ſupport the idle, who, in one Seaſon of the Year, would conſume all the Labours of the other, and eſpecially at a time when the Bees themſelves can find nothing more to ſubſiſt on; and ſo, *Chevalier*, if the Drones are conſtrained to be their own Caterers, it is owing not only to Oeconomy, but Neceſſity itſelf.

Chev. You are very unwilling, Sir, that one ſhould entertain an ill Opinion of your favourite Bees, and it is evident you are very fond of this Inſect.

Prior. I confeſs they furniſh me with a profitable Revenue; and I have known ſome Years wherein my Bees brought me in more than my Benefice.

Counteſs. That is not the Reaſon why they are favoured with your Complaiſance; you are warm in eſpouſing their Intereſt, becauſe they faithfully obſerve the Moral you inculcate, that thoſe who will not work ſhould not eat.

Prior. That may very well be; but, all Complaiſance and Intereſt apart, 'tis impoſſible to give even a ſmall Attention to the Manners and Maxims of this little People, without finding them perfectly amiable in their Conduct as well as their Induſtry.

Chev. Their Manners, I confeſs, charm me, but their Labours deſerve a little Conſideration, and that is the Point I would willingly come to.

The Implements of Bees.

Prior. Before I entertain you upon this Head, it will be neceſſary to let you ſee their Implements. The *Count*, who had ſurveyed them with his Microſcopes more accurately than myſelf, will not be ſatisfied with any thing I can advance.

Count. I willingly undertake their Deſcription, but don't pretend to give you a compleat Analyſis of a Bee's Body; it will be ſufficient, my dear *Chevalier*, to take Notice of the principal Parts with which Nature has ſupplied them, and the Uſe to which they are devoted.

The Form of a Bee.

The Jaws.

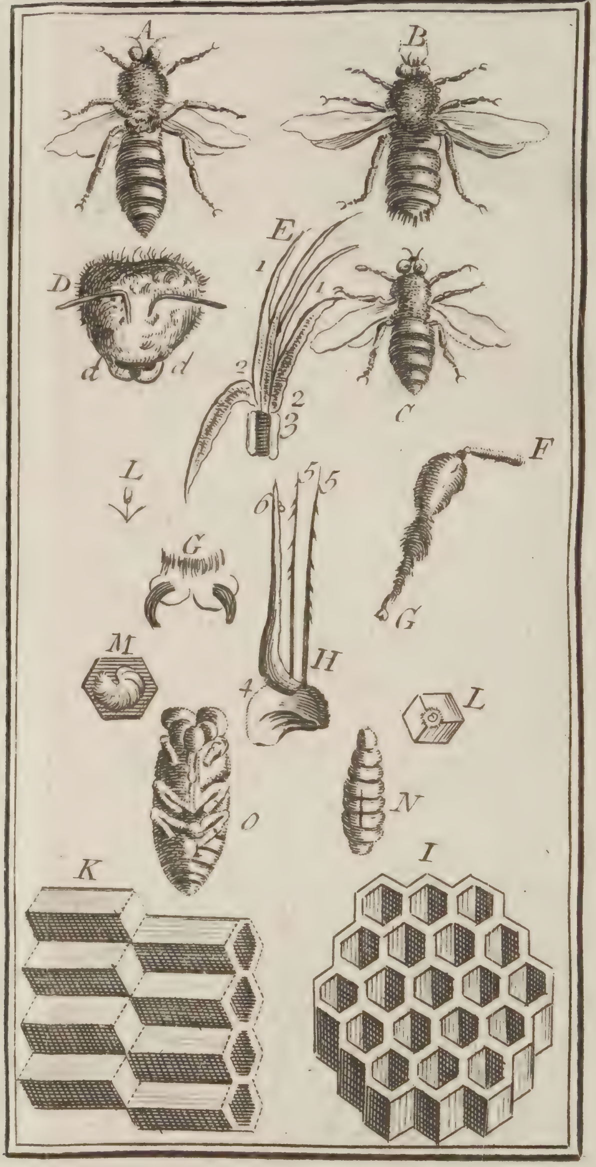
The Body of a Bee is divided by two Ligaments, into three Parts or Portions, the Head, the Breaſt and the Belly. The Head is armed with two Jaws, and a Trunk: The former of theſe play like two Saws, opening and ſhutting to the Right and Left: Theſe Saws ſerve them inſtead of Hands, to hold and knead their Wax, and to throw away whatever incommodes them. The Trunk is a — but I ſhall do better to imitate the *Prior*, and addreſs myſelf to your Eyes, ſince I have an Opportunity of ſo doing. I have here a couple of theſe Trunks, glewed upon two Slips of Paper. Look upon them one after another in the Microſcope.

Prior. They could not be more advantageouſly placed to make one diſtinguiſhed by means of the other. Perhaps the *Chevalier* may think theſe two Figures are the ſame, or two Trunks that have a perfect Similitude to each other.

Chev. I ſee one is twice as long as the other; that which is the longeſt, is thick at one End, and tapers to the other Extremity; it has likewiſe a ſmall Bending towards the Middle, and at the Bottom, is wound about by four Branches that are hollow within, like a Reed cut into four Parts. I don't comprehend all this.

Count. What you ſay is, however, very juſt. Have a little Patience, and obſerve the other.

Chev.



Bees.

Chev. The other is ſtill thicker, very ſhort, and without the four Branches

Count. Are you ſure of that?

Chev. Stay, my Lord, if you pleaſe; I think I begin to diſcover them more exactly: This ſecond Trunk muſt needs be ſheathed, and the Branches perform the Office of a Scabbard. The firſt Trunk is unfolded for Work, and the ſecond wrapped up in the peaceful Enjoyment of its Acquiſitions. This evidently juſtifies what the *Prior* told me laſt, That the minuteſt Things in Nature were appointed to ſome peculiar End and Purpoſe; and that the Deity is as conſpicuous in the Structure of a Fly's Paw, as he is in the bright Globe of the Sun himſelf.

Prior. You muſt habituate yourſelf to comprehend that this Appointment is certain, even in thoſe Things where it is not underſtood; becauſe at every Step you will find it, tho' the Reaſon does not immediately appear; 'tis your Part to enquire after it, and to admire and glorify God in the Diſcovery. Shew the Trunk of a Bee to whom you pleaſe, it may be ſaid, it is but a Fly's Paw; to what Uſe can it be appropriated? And yet this Inſtrument is ſuch, that a Bee, with its Aſſiſtance, can collect more Honey in one Day, than an hundred Chymiſts could extract in a hundred Years; and the Wiſdom of the Creator, that appears ſo evidently in the Preſent he has made of this precious Inſtrument to the Bee, is not leſs apparent in the Means with which he has furniſhed her for its Preſervation. For this Trunk is long and taper, as well as pliant and flexible in the utmoſt degree, that the Inſect may be enabled to probe to the Bottom of Flowers, through all Impediments of their Foliage and Chives, and drain them of their treaſured Sweets. But were this Trunk always extended, it would prove incommodious, and be liable to be ſhatter'd by a thouſand Accidents: It is therefore compoſed of two Pieces, connected by a kind of Spring or Joint, in ſuch a Manner, that after the Performance of its neceſſary Functions, it may be contracted, or rather folded up; and, beſide this, it is fortified againſt all Injuries, by four ſtrong Scales, two of which cloſely ſheath it; and the two others, whoſe Cavities and Dimenſions are larger, encompaſs the Whole.

The Breaſt.

Count. Let us now proceed to the reſt of the Body. The middle Part, or Breaſt of a Bee, ſuſtains the Legs, which are ſix in Number, together with four Wings, two greater and as many leſs; which ſerve not only to tranſport her where ſhe pleaſes, but by the Noiſe they make, to advertiſe the Bees of their Departure and Arrival, and likewiſe to animate them mutually when they are at work. Here is a dead Bee, let us take Notice of the Hair which covers her whole Body, and aſſiſts her to retain the little Grains of Wax that fall from the Top of the Chives to the Bottom of the Flowers. In the next Place obſerve, at the Extremity of her Paws, two little Hooks, that the Miſcroſcope will render viſible, and exhibit to you in the Form of two Sickles riſing out of the ſame Handle, with their Points oppoſite to each other. Theſe hooked Claws, that are ſo ſerviceable to the Bee in a thouſand Inſtances, are clapped over two Balls of Sponge, to render her ordinary March more eaſy and agreeable.

The Belly.

The Belly of this Inſect is diſtinguiſhed into ſix Rings, which lengthen, and likewiſe contract themſelves, by ſliding over one another. The Inſide of this Region of the Body conſiſts of four Parts, the Inteſtines, the Bag of Honey, the Bag of Poiſon, and the Sting.

The Office of the Inteſtines is to digeſt the Food, in the ſame manner this Function is performed in all other Animals. The Bag of Honey is as tranſparent as Cryſtal, and contains the fluid Sweets extracted from Flowers by the Bee, a ſmall Portion of which muſt remain in the Bag to nouriſh the Animal, but the largeſt Quantity is diſcharged into the little Cells of the Magazine, to ſupport the whole Community in Winter. The Bag of Poiſon or Gall, hangs at the Root of the Sting, through the Cavity of which, as thro' a Pipe, the Bee ejects ſome Drops of this venomous Liquor into the Wound, and ſo renders the Pain more exceſſive.

The Sting.

The Sting is compoſed of three Parts, the Sheath and two Darts *. The Sheath tapers into a very fine Point, near which is an Opening, calculated to give a free Paſſage to the Gall. The two Darts are launched through another Aperture, and are planted with ſmall ſharp Points, like the Beards of a Hook, and which riſing a little obliquely, render the Inciſion more afflictive, and create the Bee a great of Trouble to draw them out; and indeed ſhe never diſengages them, if the wounded Party happens to ſtart, and put her into Confuſion; but if one can have Patience to continue calm and unmoved, ſhe brings down theſe lateral Points, and clinches them round the Shaft of the Dart; by which means ſhe recovers her Weapon, and gives leſs Pain to the Perſon ſtung.

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* Theol. Phyſ. Derham.

The Scabbard is likewiſe finely pointed, and makes the firſt Penetration, which is ſucceeded by the Injection of the Darts and poiſonous Liquor. This Scabbard has very vigorous Muſcles, which contribute to its Diſengagement from the Wound; but when it has been plunged too deep, theſe Muſcles are torn from the Body of the Bee, and remain with the Sting. The Liquor, which ſhe at the ſame time infuſes into the Wound, cauſes a Fermentation, attended with a Swelling, which continues ſeveral Days; but that may be prevented, by immediately drawing out the Sting, and enlarging the Puncture, to give Perſpiration to the venomous Matter. So much for the Implements of Bees.

Let us now proceed to their Labours, and particularly the Structure of their Combs.

Chev. Permit me, my Lord, to aſk the *Prior*, what Method they take to aſſemble all the Bees in one Hive?

The Hive.

Prior. Do but imagine to yourſelf, a Tribe of theſe Animals lodged either in the Hollow of a Tree, the Cavity of a Rock, or in a Hive they have accidentally found. There they bring up their Young, and when theſe are come to Maturity, they raiſe another Progeny. The whole Society dwell peaceably together, as long as their Habitation is ſufficiently ſpacious and convenient; but when the Numbers multiply to ſuch a Degree as renders them incapable of rearing a new Generation, without incommoding themſelves, then the old Bees, in whom the Rights and Sovereignty of that Republick are veſted, publiſh an Edict, commanding all of ſuch an Age and under, to ſeek a new Settlement, and evacuate the Place at a certain Time, threatning the Diſobedient with the utmoſt Severity of their Stings. I may perhaps be miſtaken in the Style of the Proclamation, ſince I have never ſeen it; but in Reality, the Refuſal to retire at the Time preſcribed, draws a bloody War on the young Swarm. However, the Command is generally received with Submiſſion; and on ſome certain Day, or rather at the ſame Inſtant, all the young Nation, with their Queen in the Van, abandon the Hive, and expatiate through the Country, in queſt of a new Habitation. This Detachment may be properly called a real Colony. The old Bees always continue in Poſſeſſion of their ancient Habitation.

Chev. Methinks I am liſtening to the Hiſtory of the *Tyrians* and *Sidonians*, who being ſtreightened for want of room, and growing very numerous, diſpatched Colonies to *Carthage* and *Cadiz*, as well as many other Places. But I interrupt the Hiſtory of the Bees.

Prior. When our young Offspring have taken the Wing, they wander with a buzzing Flight thro' the Air, in ſearch of a commodious Retreat, and ſometimes fix in a Cluſter upon the Trunk of a Tree, and ſometimes on a Branch. It may be ſuppoſed, that ſome of them are deputed to the Office of Scouts, and when, in purſuance of their Commiſſion, they have found either a ſpacious Cavity in a Wall or the Hollow of an old Tree, or elſe a Hive, which the Country People, who are always vigilant on thoſe Occaſions, prepare for their Accommodation, after they have rubbed it over with Balm, Thyme, and other odoriferous Herbs; the Queen, upon the Repreſentation made to her, or in Conſequence of her own Obſervations, puts herſelf in Motion; upon which the whole Cluſter diſengage themſelves, and follow their Sovereign, who enters into the Cavity preſented to her, takes Poſſeſſion of the Place, and there ſettles with all her People. 'Tis frequently the Cuſtom to ring a little Bell, or tinkle a Braſs Pan, to advertiſe them that a Manſion is prepared for their Reception. This Sound makes an Impreſſion upon them, and compoſes their Diſorder: And perhaps, they miſtake it for a Peal of Thunder, likely to be ſucceeded by a dangerous Storm. However, in the very Inſtant either of the Fear, or Tranquility that the Sound inſpires, they very attentively conſider the offered Retreat. They are not diſpleaſed if you oblige them, by ſome gentle Conſtraint, to enter into the Hive; or perhaps, their natural Inclinations may determine them to chuſe a Sanctuary there. When this is done, he that preſented the Hive to them, removes it very tenderly, and they ſuffer themſelves to be carried off without any Reſentment. The Hive is then placed upon a Stand of level Planks, cloſely riveted together, or upon a Plat of Earth cruſted over with a Superficies made of the Duſt of Bricks, or Tiles, in order to exclude all Inſects and Exhalations. A little Opening is left at the Bottom of the Hive, after which they range themſelves in the Manner they are well acquainted with; what is afterwards tranſacted, falls more within the *Count*'s Province than mine.

The Comb.

Count. When the Labours of Bees are under our Examination, we may conſider the Materials they employ in Building, the Uſe to which that Building is appropriated, and the Manner wherein the whole is tranſacted. The Materials * are only Glew and Wax, which they collect from various Flowers, the Building is uſed as a commodious Habitation for themſelves and their Offspring; and as to the Manner of erecting it, let me inform you of ſome Inſtances of their Sagacity. I am unacquainted with the Language ſpoken by the Nation of Bees, but that they have a Language which they underſtand, and agree to uſe for the mutual Communication of their Thoughts, is a Fact I take to be undeniable. When they begin to build the Hive, they divide themſelves into four Bands; one of which is conſigned to the Fields, to collect Materials for the Structure: The ſecond works upon theſe Materials, and form them into a rough Sketch of the Dimenſions, and Partitions of the Cells. All this is poliſhed and compleated by the third Band, who examine and adjuſt the Angles, remove the ſuperfluous Wax, and give the Work its neceſſary Perfection. The fourth Band bring Proviſions to the Labourers, who cannot leave their Work; but no Diſtribution is made to thoſe whoſe Charge calls them to the Fields, becauſe it is ſuppoſed they will hardly forget themſelves; neither is any Allowance made to thoſe who begin the Architecture of the Cells, and indeed their Province is very troubleſome, becauſe they are obliged to level and extend, as well as cut and adjuſt the Wax with their Jaws; but then they ſoon obtain a Diſmiſſion from their Labour, and retire to the Fields to regale themſelves with Food, and wear off their Fatigue with a more agreeable Employment. Thoſe who ſucceed them, draw their Mouth, their Paws, and the Extremity of their Body, ſeveral Times over all the Work, and never deſiſt till the whole is poliſhed and completed; and as they frequently need Refreſhments, and yet are not permitted to retire, there are Waiters always attending, who ſerve them with Proviſions when they require them.

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* M. Maraldi.

Chev. Have you ſeen this, my Lord?

Count. Very perfectly. They expreſs their Meaning by Signs. The Labourer who has an Appetite, bends down his Trunk before the Caterer, to intimate that he has an Inclination to eat; upon which the other opens his Bag of Honey, and pours out a few Drops, which I have diſtinctly ſeen rolling thro' the whole Length of his Trunk, that grew ſenſibly ſwelled in every Part thro' which the Liquor flowed. When this little Repaſt is over, the Labourer returns to his Work, and his Body and Paws repeat the ſame Motion as before.

Chev. Is it very long before the Work is compleated?

Count. Tho' the Elegance and Proportions of it are admirable, yet the Builders are ſo indefatigable *, that a Honey-Comb compoſed of a double Range of Cells, backed one againſt another, and which is a Foot long, and ſix Inches broad, is finiſhed in one Day, ſo as to be capable of receiving three Thouſand Bees.

Beſide this, the Symmetry of theſe Combs is abundantly more compleat than that of a Waſp's Neſt; for the Cells not only terminate at the Bottom in a Point, accommodated to receive the little Egg, and concenter the Warmth which it would not enjoy in the ſame Degree, were it depoſited on a Flat; but they are likewiſe compoſed of little triangular Pannels, that regularly unite in a Point, and exactly correſpond with the like Extremities of the oppoſite Cell. Break a few of theſe little Apartments, and you will find the Fact to be as I have deſcribed. Take Notice alſo, that they ſhape and diſpoſe their Combs in a very different Manner from the Waſps; for whereas theſe Inſects build but one Range of Cells, and place them horizontally over one another, the Bees make their Cells double, or compoſed of two Ranks of Apartments, the Extremities of which touch each other, and are perpendicularly ſuſpended with an Interval between each two, that affords the Bees a Paſſage ſufficiently ſpacious, and, at the ſame Time, contracted enough to promote all the Warmth they can poſſibly need.

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* M. Maraldi.

Chev. But, my Lord, I find at the Entrance into all the Lodges a kind of Ledge, which makes the opening at the Door narrower than the Dimenſions within; whereas the Paſſage into the Waſp's Cell is as wide as the Apartment itſelf.

Count. This is another wiſe Precaution; for as the Bees live ſeven or eight Years, and more, and the Waſps ſeldom ſurvive one, in which Circumſtance the Conduct of Providence is very remarkable, and calls for our Gratitude; they fortify the Aperture of their Cells with this Ledge, which, being joined to that of the neighbouring Cells, makes the whole very difficult to be ſhattered, ſo that the Work continues ſeveral Years uninjured, notwithſtanding the Shocks occaſioned by the frequent Ingreſs and Returns, as well as the repeated Efforts of the Mothers who come there to lay their Eggs, and notwithſtanding the Motions of the Labourers, who there depoſit their Wax and Honey, and the Struggles of the Nymphs, who, when they become Bees, make vigorous Endeavours to diſengage themſelves from their Confinement.

Prior. Theſe Habitations, *Chevalier*, differ very much from ours, which always decay with Time, whereas they grow ſtronger by Duration, at leaſt to a certain Period.

Chev. How can that be?

Prior. The Foundations of our Houſes ſink with the Earth they are built on, the Walls begin to ſtoop by Degrees, they nod with Age, and bend from their Perpendicular; Lodgers damage every thing, and Time is continually introducing ſome new Decay. On the contrary, the Manſions of Bees grow ſtronger, the oftener they change their Inhabitants. Every Worm, before its

Converſion into a Nymph, faſtens its Skin to the Partitions of its Cell, but in ſuch a Manner as to make it correſpond with the Lines of the Angles, and without the leaſt Prejudice to the Regularity. In one Summer the ſame Lodging may ſerve three or four Worms ſucceſſively, and when that Seaſon returns, it can again accommodate the ſame Number. Each Worm never fails to fortify the Pannels of his Chamber, by arraying them with his Spoils; and the next Apartment likewiſe receives the ſame Augmentation. I have ſometimes found ſeven or eight of theſe Skins ſpread over one another, ſo that all the Cells being incruſted with ſix or ſeven of theſe Coverings, well dried and cemented with a ſtrong Glew, the whole Fabric daily acquires a new Degree of Solidity.

Chev. But I find an Inconvenience in this, Sir; for ſo many Skins may happen to be glewed over one another, as to render the Apartment too contracted in its Dimenſions.

Prior. The Difficulty you ſtart is very reaſonable, and I muſt refer you to the *Count* for a ſatisfactory Anſwer.

Count. Can you gueſs how the Bees proceed in this Caſe? They alter the Property of theſe Cells, and lodge their Young where they formerly ſtored their Honey, and at the ſame Time depoſit their Honey where they once lodged their Young; at leaſt this is the Opinion of ſome Obſervers, tho' I ſhall not undertake to warrant it. As to the reſt, you find the Bees are ſkilful enough in their Works, to induce you to believe they know when it is proper to clear away Superfluities; and it muſt be confeſſed, that at the End of ſix or ſeven Years, the Cells become too contracted, and all the Work grows ruinous. You have ſeen, my dear *Chevalier*, their Expertneſs in Architecture. We muſt now give you ſome Inſight into their Oeconomy, and direct your Obſervation to what paſſes in the Magazines of Wax and Honey: Their Structure and Uſe will be equally entertaining to you. They have firſt of all, the Precaution to——

Chev. Ah! my Lord, all is at an End: I ſee five or ſix Fox-Hunters, who are now alighting in the Court, and the Servants are going to take their Horſes into the Stable.

Counteſs. We need not break up in a Hurry, thoſe Gentlemen muſt have their Boots taken off, and Notice will be given us when to wait on them. The *Prior* has ſhewn us the Comb, and its Contents; but has not given us a Sight of what is wrapp'd up in that Paper.

Prior. You know, *Chevalier*, the Cells where the Young are lodged; you likewiſe have ſeen thoſe which contained the Wax; and I have here, in a Sheet of white Paper, a Piece of the Honey-Comb.

Chev. Muſt not ſomething be done to the Honey, before it can be fit to eat?

Prior. No, Sir, it is here in all its Purity, and infinitely better than when it has been degenerated by the Hands of Men; pray venture to taſte a little, only throw the Wax away.

Chev. I never taſted any thing more delicate, and am no longer ſurpriſed that the Authors I have read, always mention Honey, when they would acquaint us with ſomething agreeable.

Prior. Honey was the Sugar of the Ancients; but we make very little Uſe of it now, ſince we have had our modern Sugar from the *Eaſt*, and *Weſt-Indies*.

Counteſs. In my Opinion, *Chevalier*, you have pretty much of the ancient Palate.

Chev. Madam, I never knew till this Day, what a Honey-Comb was.

Counteſs. Be wiſe then in Time. You ſee the *Prior* is always the ſame, and gives a perpetual Reliſh to every thing he does. When he takes his Leave of us, he will go and catechiſe in ſome little Hut, where, inſtead of Honey, he will not fail to diſtribute his Alms.

Prior. I am very glad my Behaviour pleaſes your Ladyſhip; I ſhall always continue to give Inſtruction, and even part with as much Honey as will be acceptable. But Charity is your Ladyſhip's Province, and I am only your Almoner.

Count. Theſe little Animals, whom we behold ſo ſociable in their Community, are induſtrious to aſſiſt each other, and prevent their mutual Neceſſities with a ſurpriſing Generoſity; and ſhall we leave our Fellow-Creatures in Diſtreſs! On the contrary, I am convinced, that the fineſt of all Pleaſures conſiſts in preſerving Perſons from Calamity, and it is a Pleaſure capable of increaſing in Proportion to our Ability to give. But let us wait on the Company.

BEES.

DIALOGUE VII.

The COUNT, *and* COUNTESS.
The PRIOR, *and*
The CHEVALIER.

Chev. GEntlemen, I deſire you to remember we are this Day to viſit the two great Manufactures of Wax and Honey. The *Prior* has taken a particular View of both, and I ſhould be glad to know firſt of all, what this Wax is.

Prior. The Bees have to Sorts, one groſs and indifferent, the other much finer *. The firſt is blackiſh, and pretty much reſembles Glew, or a very thick Pitch. The other Kind of Wax is a natural Fat, or a vegetable Oil, finely ſcented, and thick. This the Bees find around theſe innumerable little Grains that are viſible on the Chives which riſe from the Bottom of Flowers, and is a Compoſition of bitter Juices they extract from certain Plants, Straw, rotten Wood, and impaired, or acid Liquors.

Chev. Wherein is this Glew uſeful?

Prior. I'll inform you. When they have found a Hive, or ſome other commodious Habitation, their firſt Employment is, to cloſe up very exactly, with this Glew, all the Fiſſures and Crannies, and ſtrengthen the weak Places, ſo that the Winds can have no Admiſſion; and the Inſects, who would otherwiſe make Depredations on the Glew, are prevented by their inſupportable Averſion to the bitter Flavour.

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* Maraldi, *ibid.*

Count. Upon this Occaſion I will relate an Event I beheld myſelf. A few Days ſince, a Snail took it into his Head to ſteal into the Glaſs Hive in my Window. There was no Entrance to paſs through but the proper one, and in the Animal went. The Porters received him very rudely at the Gate; and the firſt Attacks they made upon him with their Stings, obliged him to march with more Expedition; but the ſtupid Creature, inſtead of retreating, thought to ſave himſelf by going forwards, and he advanced into the very Middle of the Hive; upon which a whole Troop of Bees faſtened upon him at once, and he immediately expired under their Strokes. The Conquerors were then in no little Perplexity how to get rid of the Carcaſs, and a Council was inſtantly held upon that Occaſion.

Chev. And your Lordſhip, without doubt, underſtood all their Debates.

Count. From firſt to laſt, the moſt experienc'd Sages among them reaſoned in this Manner: To drag the Carcaſs out by main Strength, is an Impoſſibility; the Maſs is by much to unwieldy, and beſide, the Body is fixed to the Floor of the Hive by its own Glew; and to leave it where it lyes, would be very inconvenient, becauſe it would prove an alluring Regale to the common Flies, and at the ſame Time be liable to Corruption and Worms; and theſe Worms, when they have devoured the Snail, will infallibly aſcend to the Comb, and attack the young Bees. The Damage was evident, and required an immediate Remedy; but you will hardly gueſs the Dexterity with which they accompliſhed it. *Chevalier*, I ſhould be glad to know your Sentiments on the Affair. How were they to conduct themſelves on this Occaſion?

Chev. So quick upon me, my Lord? You are really very ſevere, to put the Queſtion to me; for it will appear that the Bees had more Preſence of Mind than myſelf. But, pray, how did they proceed?

Count. They incruſted the whole Snail with Glew, and cemented it ſo cloſe, that all the external Air was excluded; and as no Inſect could have Acceſs, to depoſit her Eggs in the Carcaſs, ſo, when this ſhould be reduced to Corruption,

ruption, no malignant Steams would tranſpire through the Incloſure.

Chev. Will your Lordſhip let me ſee the poor Snail's Tomb?

Count. You ſhall have a Sight of it To-day. It wants nothing but an Epitaph.

Chev. When the Inſide of the Hive is well pitched, and the Bees under ſhelter, how are the Cells diſpoſed?

Prior. The Foundation of the Building is faſtened to the Top of the Hive; there they lay a Bed of Glew, to which they fix the firſt Cells of the Comb, which they continue downwards, and enlarge them till they have no more room left. The Comb is divided into three Cantons; one, where they rear their Young; another, where they ſtore their Wax for their future Occaſions; and the third, where they preſerve their Honey for the Winter.

I have nothing particular to acquaint you with about their Young, the Circumſtances are pretty near the ſame as they are with the Waſps. When the Worm has left the Egg, the Mother conſtantly ſupplies it with Honey; and at the Expiration of ten, or twelve Days, when it has had its Fill, an old Bee comes and cloſes up the the Cell with Wax. The Worm in its Retirement changes into a Nymph, and the Nymph becomes a Bee; and after fifteen Days repoſe, the young Bee pierces through the waxen Door, and, when ſhe has dried her Wings, flies among the Flowers, ſteals their Sweets, and is perfectly acquainted with every neceſſary Circumſtance of her future Conduct.

As to the Structure of the Wax, the *Count*'s Obſervations have been more accurate than mine.

The Wax.

Count. I confeſs it is a Particular that has very much amuſed me. The Wax is a Proviſion altogether as neceſſary for them, in one Senſe, as the Honey itſelf; they build their Apartments with it, and it cloſes the Cells of the Nymphs, as well as thoſe where the Honey is treaſured. When any Accidents happen, any Fractures open, or when-ever the Species grow too numerous, they recur to the Wax, and therefore are always careful to provide a ſufficient Quantity in good Time. They ſearch for it upon all Sorts of Trees and Plants, but eſpecially the Rocket, the ſingle

Poppy, and generally all Kinds of Flowers. They amaſs it with their Hair, with which their whole Body is inveſted. 'Tis ſomething pleaſant to ſee them roll in the yellow Duſt that falls from the Chives to the Bottom of the Flowers, and then return covered with the ſame Grains; but their beſt Method of gathering the Wax, eſpecially when it is not very plentiful, is to carry away all the little Particles of it with their Jaws and Fore-feet, to preſs and work them up into little Pellets, and ſlide them, one at a Time, with their middle Feet, into a Socket or Cavity, that opens at their hinder Feet. This Cavity is made to receive the Wax, like a Spoon, and the Hair which covers their Feet, ſerves to keep the Burden fixed, and ſteddy, till they return home. They are ſometimes expoſed to Inconveniencies in this Work, by the Motion of the Air, and the delicate Texture of the Flowers, that bend under their Feet, and hinder them from packing up their Booty; on which Occaſions they fix themſelves on ſome ſteddy Place, where they preſs the Wax into a Maſs, and wind it round their Legs, making frequent Returns to the Flowers; and when they have ſtocked themſelves with a ſufficient Quantity, they immediately repair to their Habitation. Two Men, in the Compaſs of a whole Day, could not amaſs ſo much as two little Balls of Wax, and yet they are no more than the common Burden of a ſingle Bee, and the Produce of one Journey. Thoſe who are employed in collecting the Wax from Flowers, are aſſiſted by their Companions, who attend them at the Door of the Hive, eaſe them of their Load at their Arrival, bruſh their Feet, and ſhake out the two Balls of Wax; upon which the others return to the Fields to gather new Treaſures, whilſt thoſe who diſburden'd them, convey their Charge to the Magazine. However, I have ſeen ſome Bees, who, when they have brought their Load home, have carried it themſelves to a Lodge, and there delivered it, laying hold of one End with their hinder Feet, and with their middle Feet ſliding it out of the Cavity that contained it; but this was evidently a Work of Supererogation, which they were not obliged to perform. The Packets of Wax continue a few Moments in the Lodge, till a Set of Officers come, who are charged with a third Commiſſion, which is to knead

Wax with their Feet, and ſpread it out into different Sheets laid one upon another. This is the unwrought Wax, which is eaſily diſtinguiſhed to be the Produce of different Flowers, by the Variety of Colours that appear in each Sheet. When they afterwards come to work it, they knead it over again; they purify, and whiten it, and then reduce it to an uniform Colour. They uſe this Wax with a wonderful Frugality, for it is eaſy to obſerve, that the whole Family is conducted by Prudence, and all their Actions regulated by good Government. Every thing is granted to Neceſſity, but nothing to Superfluity; not the leaſt Grain of Wax is neglected, and if they waſte it, they are frequently obliged to provide more, at thoſe very Times when they want to get their Proviſion of Honey. When they open the Cells of Honey, they take off the Wax that cloſed them, and carry it to the Magazine. You may likewiſe judge of their Oeconomy by another Inſtance: When a young Bee frees itſelf from its Priſon, by breaking down the Partition of Wax that ſhut it up, two old Bees immediately preſent themſelves, and carry away all the Remains of this waxen Partition; after which they immediately repair the Ledge of the Cell, and bear all the Wax that is left to the Repoſitory. Thus, you ſee, nothing is loſt.

Counteſs. But is not this Oeconomy, my Lord, much of a Piece with your Account of the Deliberations about the Snail? I am afraid all the Ingenuity I admire in theſe Proceedings, flows only from you.

Count. I have ſometimes, in a Vein of Pleaſantry, ſupplied them with ſuch kind of Reaſonings; but, in Reality, the ſame Wiſdom that created theſe Animals, has enabled them, for their Preſervation, to act as conſiſtently as if they were influenc'd by Reaſon itſelf: And as to the Frugality I have been deſcribing, 'tis what you yourſelf may be a Spectator of when-ever you pleaſe.

Chev. Then as to the Honey, my Lord; will you be ſo good as to tell me what it is, and how they collect it?

Count. The Ancients believed Honey to be an Emanation of Air, a Dew that deſcended upon the Flowers, as if it had a limited Commiſſion to fall only there. But it has been ſince diſcovered that Dews and Rains are very oppoſite to Honey in their Qualities; they waſh it away, and prevent the Bees from finding it. Honey is rather an Efflux, or Tranſpiration of the fineſt Particles of the Sap in Plants, which evacuate through the Pores, and afterwards condenſe on the Flowers; and as theſe Pores are more expanded in the warm Sun-ſhine than at any other Time, ſo you never ſee the Flowers more repleniſhed with a viſcous and vermilion Juice, nor the Bees more tranſported with Ardour and Joy, than when the Sun diſpenſes his brighteſt Rays. I likewiſe take it for granted, that the Seaſon has proved favourable, becauſe exceſſive Rains either waſh away the beſt Salts from the Soil, or injuriouſly dilute its pureſt Juices; as on the other hand, the immoderate Length of a dry Seaſon prevents thoſe Juices from flowing into the Plant.

Chev. Since we know what Honey is, I ſhould think we might go ourſelves, and extract it from the Flowers.

Count. Yes; without doubt the Thing is practicable. You only want an Inſtrument for that Purpoſe. Go to work, my dear *Chevalier*, and make a Trunk: you remember I ſhewed you a couple Yeſterday.

Chev. I deſerve to be rallied for my wiſe Obſervation: I ſhould rather indeed have aſked your Lordſhip, whether the Bees content themſelves with ſucking the Honey from the Flowers, and conveying it home; or is it your Opinion, that the Juices of the Flowers are converted into Honey by the Labours of the Bees?

Prior. For my Part, I am apt to think the Bee makes no Alteration in the Honey, but collects this delicious Syrup as Nature produces it; and firſt fills her Bag, and then diſcharges it into the Magazine.

Count. I am of your Opinion in that Particular, and could never obſerve they were able to condenſe the Honey, when it was too liquid, as *Virgil* affirms. Perhaps it may be true, that when they receive it into their Body, they purify, and give it ſome Conſiſtence. But all I have remarked on the Article Honey amounts to no more than this: They ſuck it up with their Trunk, and empty it into the Cells appropriated to receive it; and when they are all full, the Bees cloſe up ſome with Wax, 'till they have Occaſion for the Honey; the reſt they leave open, and all the Members of the Society reſort there, and take their Repaſt with a very edifying Moderation.

Chev. The Bees certainly act with more Regularity than ourſelves.

Prior. The Hive is a School to which Numbers of People ought to be ſent; Prudence, Induſtry, and Benevolence, Publick-ſpiritedneſs and Diligence, Oeconomy, Neatneſs, and Temperance, are all viſible among the Bees: Or, rather, let us ſay, they read us Lectures upon them.

Count. What moſt affects me, in theſe little Animals, is to ſee them actuated by that ſocial Spirit which forms them into a Body Politic, intimately united, and perfectly happy. Look on a Swarm of Bees, and obſerve the Diſpoſition that influences every Individual. They all labour for the general Advantage; they are all ſubmiſſive to the Laws and Regulation of the Community; no particular Intereſt, no Diſtinction but thoſe which Nature, or the Neceſſities of their Young have have introduced among them. We never ſee them diſſatisfied with their Condition, or inclinable to abandon the Hive in Diſguſt, to find themſelves Slaves or neceſſitous. On the contrary, they think themſelves in perfect Freedom, and perfect Affluence, and ſuch indeed is their real Condition: They are free, becauſe they only depend on the Laws; they are happy, becauſe the Concourſe of their ſeveral Labours inevitably produces an Abundance that conſtitutes the Riches of each Individual. Let us compare human Societies with this, and they will appear altogether monſtrous. Neceſſity, Reaſon, and Philoſophy have eſtabliſhed them under the commendable Pretence of mutual Aids and Benefits; but a Spirit of Selfiſhneſs deſtroys all; and one half of Mankind, to load themſelves with Superfluities, leave the other deſtitute of common Neceſſaries.

Prior. As long as Men are not conducted by the Spirit of God, they are certainly the moſt unjuſt and corrupt of all Animals.

Count. I cannot expreſs my Indignation, when I ſee to what Proſtitutions our Species degrade themſelves, eſpecially when they are poſſeſſed with the Fury of Ambition, and determined to live at Eaſe, without giving themſelves the leaſt Pain, to ſee their Fellow-Creatures barely poſſeſſed of Food and Raiment. But let us cloſe this diſagreeable Scene, and though we find our Manners condemned by the

Practice of theſe little Animals, who aſſociate with ſo much Tranquillity and Union, yet let us go on to make them the Subject of our Examinations; 'tis an Article that infinitely delights me. I have ſeen at the Prior's Houſe, a Glaſs Hive, wherein, as he has told me more than once, he has had a Swarm of wild Bees. Pray, Sir, favour us with ſome Account of them.

Prior. As I knew your Lordſhip had made many Obſervations on the common Sort of Bees, I thought it would be better for me to beſtow ſome Notice on thoſe who are Wild, in order to obſerve the Difference. Theſe Creatures, that ſeveral People call Drones and Hornets, are nothing near ſo induſtrious and frugal as the domeſtick Bees. They are more negligent in their Settlements, and their Work is in every Particular inferior to that of the others; but for all this, it has its Beauty. The Neſt is compoſed of dried Leaves mixed with Wax. This Neſt, which they uſually build in ſome Cavity dug in the Earth by a Field Mouſe, is well vaulted, to preſerve it from Rains and the falling in of the Earth. They worked in the ſame Manner when they were in the Hive, as they would have done in the Field. The Principles of their Architecture are invariable. The Neſt is all perforated with different Holes, like a Sponge, ſo that one may eaſily ſee all that paſſes within. Each Hornet builds with the Wax, a little Cell, about the Size of a large Pea, cut through the Middle, and round and hollow like half an Egg Shell. From theſe different Cells joined together, reſults a ſort of Cluſter very agreeable to the Eye. The Females, whoſe Number among the Bees and Waſps appears to be very inconſiderable, lay their Eggs in the open Cells; when this is done, ſome other Bees cloſe them up with Wax; after which they ſtand upon the Covering, and are in a perpetual Agitation, either to give Warmth to the Eggs, or at leaſt to repel the Cold from them. When the Worms leave the Eggs, they endeavour to break down the Door of their Lodge? The Bees without, aſſiſt them in rubbing the Wax, and making it ſoft, and then comes a large Bee, who devours all the waxen Covering.

Wild Bees.

Chev. What, does he live upon the Wax?

Prior. No, Sir: but he melts it in his Stomach, which is very hot; and then employs it elſewhere in ſome other Work. The Worms who are hatched fall into Convulſions, which moiſten them all over with Sweat; and what then tranſpires through their Body, forms a Glew that gradually hardens, and becomes a little white Skin, which immediately enfolds them. This is their State of Nymphs, and they then look like ſo many Grains faſten'd to one another, and which, all together, form a little Cluſter. After this, out of each Nymph's Shell proceeds a little Bee, who begins to rub his Eyes with his fore Paws. His Wings, that are ſtill ſpread on his Back, and moiſt, grow dry in the Air by degrees; and in the Space of a Quarter of an Hour, he ſprings aloft, and immediately attempts to fly at a Venture with thoſe of his own Age; the young ones are, for ſome time, permitted to ſport as they pleaſe, and all the little Bees do nothing, for the three firſt Days, but flutter up and down, and interrupt the Work of the larger Inſects, who at length begin to be weary of theſe wanton Liberties, in conſequence of which they chaſtiſe the little Offspring, and bring them down to the Ground; upon which the young ones, after they have turned round a conſiderable Time, as if they were intoxicated, begin to work in their Turn, and carry Earth to the Neſt, to ſuſtain the Sheets of Wax that form the Vault. This Earth they cement and ſpread out with a backwrad Motion of their Bodies over it. The old ones work in Wax, and the Young only perform the Functions of Maſons Servants.

Chev. Have not the wild Bees a King or Queen, as well as the domeſtick Tribe?

Prior. I have certainly ſeen amongſt mine, and that very frequently, a large Inſect, much ſuperior in Size to the reſt, and without Wings or Hair; it was as bare as a plucked Fowl, and black as Jet or poliſhed Ebony. This King goes from time to time to ſurvey the Work; he enters into each particular Cell, ſeems to take their Dimenſions, and examine whether the Whole be finiſhed with due Symmetry and Proportion.

Count. I am not certain, Sir, whether you have ſufficiently conſidered this Circumſtance, or not, and am very apt to ſuſpect this Monarch to be a Queen, and that her Viſits to each Cell, only tend to depoſite her Eggs there.

Prior. I readily confeſs my Inaccuracy in this Particular, and your Lordſhip is much more exact and attentive than myſelf, in all your Obſervations. But however, I will proceed in the Account of what I think I have ſeen, and beg the Favour of you to rectify whatever may lead the *Chevalier* into a Miſtake. When this Queen makes her Appearance, all the Bees who preſent themſelves in her Way, form a Circle around her, they clap their Wings, and raiſe themſelves on their fore Feet, and after ſeveral Leaps and Curvets, attend her throughout her Progreſs; at the Concluſion of which the Queen retires, and all the reſt return to their Employment. But theſe wild Inſects are far from devoting themſelves to Labour, with the ſame Vigour and Aſſiduity which the common Bees diſcover. In the Morning, the Young appear indolent, and are with great Difficulty brought to apply themſelves to their ſeveral Functions; but in order to rouze them, one of the largeſt of the Band, every Morning at half an Hour paſt Seven, extends one half of his Body out of a Cavity contrived for that Purpoſe, and ſeated on the moſt elevated Part of their City; there he claps his Wings for the Space of a Quarter of an Hour, and, with the Noiſe, awakens all his People. This ſummons them to work, and is the Drum that beats the Signal of their March. And I have frequently obliged my Fraternity to take Notice of this kind of Diſcipline, which exceedingly diverted them. There is likewiſe another, who keeps Guard all Day, and I have ſeen him acquit himſelf of his Commiſſion with a Vigilance that aſtoniſhed me. When I have ſtruck the Hive a little harder than ordinary, the Centinel immediately quitted his Box, and with an Air of great Uneaſineſs and Emotion, mounted to the Top of the Vault, running here and there, to diſcover what might occaſion the Alarm; when he has ſatisfied himſelf that no Danger or Enemy was near, he returned to his former Poſt. I have ſometimes thrown a common Bee into the Hive, after I had plucked off one of his Wings; but he was inſtantly ſeized by the Centinel, and laid dead on the Spot.

Chev. This makes the Account I have read in my *Virgil*, of the Guard kept by Bees, very credible. But what, Sir, is the Food of theſe wild Bees?

Prior. They eat a kind of Honey, but then 'tis inferior in Purity to that of the domeſtick Bees, becauſe they extract it from Flowers which grow wild, and are impregnated with Juice of a bitter Flavour.

Chev. Do they ſtore up any Proviſions?

Prior. Juſt as the Bees do; and, for that Purpoſe, they employ the Cells out of which the Worms proceeded: Theſe they fill with Honey, and then cloſe them up carefully with Wax. They are burdened with a Number of Sluggards, and 'tis probably againſt them that they uſe this Precaution.

Count. But in what Inſtance, Sir, did you diſcover their Idleneſs?

Prior. In this: When the reſt of their Companions have been employed in the Fields, I have obſerved theſe roving at a ſmall Diſtance from the Hive. They give themſelves the Air of working a little, and then return home and eat, without having done any thing material.

Count. Your being ſo much accuſtomed to ſee bad Actions in others, makes you ſuſpicious. But theſe Sluggards, you mention, ſeem to me to be the Males, as there are ſuch among the Bees; and they are nouriſhed for a Seaſon, in Requital of their paſt Service; but when Winter comes on, they are probably ſent away to provide for themſelves elſewhere.

Prior. What your Lordſhip ſays, appears very probable; and I ſee no Reaſon why the wild Bees ſhould not, as well as the others, have their Queen, their Males, and likewiſe a whole People without Diſtinction of Sex. But this is a Point that requires farther Examination.

Count. Let me beg the Favour of you, Sir, to proceed in your Obſervations on what paſs'd in your Hive. All this is new to me.

Prior. Ah, my Lord! my Obſervations are all at an End, for we met with a very great Accident.

Chev. Pray, what was that?

Prior. Four Days ago, our Queen came out very early in the Morning, and all enfeebled with Age, proceeded with a trembling March to the Confines of her Dominions. I ſaw her lye down behind a little Eminence; and after ſhe had languiſhed a few Moments ——

Chev. What happened?

Prior. She breathed her laſt, and all the City was in

Deſolation. The Drum did not beat the Signal that Day, and nothing was to be ſeen but a general Grief and Dejection.

Chev. The Prior makes me ſympathiſe in their Affliction. But what might be the Event?

Prior. It was natural for great Diſorders to enſue in the State; the Number of Inhabitants ſince that time has daily diminiſhed, and they are continually removing in Queſt of a new Settlement. The Day before Yeſterday, there was a very fierce Battel, and one Animal, more enterprizing than the reſt, loſt his Head; I ſaw him run without it to the Top of the Vault, where he did not expire till this very Day. All Order was at an End; the Morning Signal was no more repeated; no Centinel made his Appearance, and the regular Labours were entirely diſcontinued.

Chev. I am not at all concerned at the Execution of the Malefactor, for I think he makes a very entertaining Figure.

Prior. My Inſects are all diſconcerted, and I believe very few of them are now left. If the *Count* will truſt the *Chevalier* in my Company for an Hour or two, I will ſhew him the Structure of the Neſt.

Count. Do ſomething more, if there are no Stings to be feared; take out the Neſt, and ſend it to me; or rather, let us reſign our Pretenſions to the *Chevalier:* It will contribute to the Embelliſhment of his Cabinet, and may be hung up with his Waſps Neſt.

Counteſs. Gentlemen, you have not yet diſcharged all your Province; we have had a good Account from you of the Induſtry of Bees; but you have not been particular enough in the Uſe we make of their Labours, and I muſt aſk the *Prior* how far theſe are capable of being extended.

Prior. When the Seaſons are not irregular, a Hive of Bees may be every Year worth a Piſtole and more. If there ſhould be two Swarms, the Profit will be double the next Year, though you ſhould deſtroy the firſt Bees with Sulphur, in order to take their Wax and Honey. They are never permitted to work above ſeven Years, becauſe they grow feeble, and their Labours are expoſed to the Ravages of Worms and Moths, who, in Proceſs of Time, find out the Secret of ſliding into the Skins with which the young Bees hang their Apartments. But I don't take upon me to give you a Detail of the Management of Hives. This is what may be learned from any common Gardiner, and the Country Houſe of honeſt *Liebaux* is in the Hand of all the World.

Every one likewiſe knows the various Uſes that are made, not only of Virgin Wax as it comes from the Hive, but of that ſort too that has been firſt waſhed and then melted, and made white, by expoſing it alternately to the Dews and Sun-ſhine. With this Wax they make not only Flambeaux, Tapers, Images, and a hundred other Things that are well known, but they likewiſe employ it with great Succeſs in anatomical Repreſentations, that perfectly imitate Nature, and preſerve thoſe who have no Occaſion to be deeply learned, from the Horror they are apt to be inſpired with at the Sight of a Carcaſs, or Fleſh in a State of Putrefaction.

The beſt Honey.

The richeſt Lands don't produce the beſt Honey; there are ſome Soils not very luxuriant, that afford Fruits, Fowls, and each Variety of Game, and generally all Productions that have finer Juices, and a more exalted Flavour: And there the Honey is exquiſite. Such, for Inſtance, is the Land about *Corbiere*, a few Leagues from *Narbonne*, and great Part of *Champagne*. The Honey of theſe Countries is in the beſt Repute. There is one very peculiar Circumſtance obſerved in the Cantons of *Champagne*, that lye contiguous to the Rivers, and are richer than the reſt, which is this: The Bees make long Excurſions into the neighbouring Countries, and prefer the Flowers they find in a dry and ſteril Soil, to thoſe that grow in the very Fields where theſe Bees were rear'd. A Gentleman who lives near the River *Aine*, and whoſe Company I enjoy'd one Day, in a Journey from *Chalons* upon the *Marne* to *Charleville*, furniſhed me with this Obſervation. We were about a League and an half from his Eſtate, which lyes in the Valley, on the Edge of the lovely Meadows of *Attigny*; as yet we ſaw nothing but Heath, and could not diſcover any Village for above a League in Circumference. Do you take Notice, ſaid he, ſhewing us a Crop of Buck-Wheat, which refreſhed us with a very agreeable Scent; do you take Notice of my Servants who are diſperſed about the Country, and are all at work for me? But perceiving that we did not comprehend his Meaning; This is the whole Myſtery, continued he, thoſe Bees, who are flying among the Flowers, come hither from a Diſtance of two or three Leagues. We daily ſee them forſake our Gardens, and take their Flight over the Meadows, deſpiſing the Oil and Fertility of our Vallies: In ſhort, they continue their Progreſs to the Mountains and Plains of *Champagne*, where they find Lavender, Thyme, Sweet Marjoram, Buckwheat, and ſeveral other Plants very little cultivated, but of a moſt delicate Sap. You will find Bees all the Way from hence to my Eſtate, and ſome curious Obſervers are perſuaded they have ſeen them, thrice in one Day, take a Journey of a League and an half, or two Leagues, to furniſh their Table to their Palate.

Counteſs. Chevalier, theſe Gentlemen are at the Expence of our Converſations; but as poor as you and I may be, I think, in Point of Honour, we ſhould endeavour to furniſh our Proportion, and bring each of us the Hiſtory of ſome Inſect To-morrow.

Chev. I have made my Court to the *Prior*, who has a Magazine of Curioſities, and purpoſe not to come with empty Hands To-morrow.

The End of the ſeventh DIALOGUE.

FLIES.

DIALOGUE VIII.

The COUNT *and* COUNTESS,
The PRIOR, *and*
The CHEVALIER.

Counteſs. PRAY, Gentlemen, let us know our Riches before-hand, and ſee what each of us contributes to this Day's Entertainment.

Count. You will have nothing from me but a Fly and a Gnat.

Prior. I intend to give you the Grillotaipa, or Mole Cricket, and the Ant.

Chev. And I the Formicaleo or Lion Piſmire, a moſt terrible Enemy to the Ants.

Counteſs. Here are Materials enough for one Entertainment, and I may reſerve my Part for another Day. When one is not rich, Oeconomy is very convenient.

Count. Let us begin with the common Fly.

The common Fly.

As weak and contemptible as this Creature may appear to us, there is ſcarce any Species of this Inſect, but what is furniſhed with five or ſix Advantages that are perpetually ſerviceable to it in all its Neceſſities. For Inſtance, it has excellent Eyes, it has likewiſe Antennæ, or Horns, Wings, Claws, Sponges, and a Trunk.

Its Eyes.

Its Eyes, as well as thoſe of Beetles, and Dragon Flies, are of a peculiar Structure: They are two little Creſcents, or immoveable Caps, diſpoſed round the Head of the Inſect, and comprehending a prodigious Number of minute Eyes, or cryſtaline Humours, ranged like Lentils, in Lines croſſing each other, in the Form of Lattice Work[*]. Under theſe one may diſcover a Set of Fibres, or optick Nerves, correſponding in Number to the external Diviſions, or little Planes; and curious Obſervers will tell you, they have counted ſeveral Thouſands in each Combination[†]. But whatever their Numbers may be, it is certain[||] that all theſe Planes are a Collection of Eyes, on which, as on ſo many Mirrors, outward Objects are painted[‡]: One may ſee the Figure of a lighted Taper multiplied almoſt to Infinity, on their Surfaces, and ſhifting its Beams into each Eye, in Proportion to its being varied in its Motions by the Obſerver's Hand.

Chev. To what End is this Prodigality of Eyes beſtowed? The Generality of other Animals are well ſatisfied with two.

Count. The Eyes of other Creatures are multiplied by Motion, if I may uſe that Expreſſion; whereas thoſe of a Fly are fixed and immoveable, and can only ſee what lyes directly before them; they are very numerous therefore, and placed on a round Surface, ſome in a high, others in a low Situation, to inform the Fly of every Thing wherein ſhe can be intereſted. She has a Number of Enemies, but, with the Aid of theſe Eyes that ſurround her Head, ſhe diſcovers whatever Danger threatens her from above, behind, or on either Side, even when ſhe is in full Purſuit of a Prey directly before her; and the ſame Object is as diſtinctly perceived by that Profuſion of Eyes, as it is by us, who behold it with no more than a Couple.

The Wings and Claws.

When we have finiſhed our Walk, I intend to ſhew you, in my Microſcope, the round Edgings, together with the glazed Subſtance and Fringe of its Wings. We ſhall then obſerve ſeven or eight Articulations, two bending Claws, and ſeveral minute Points, on each of its Paws. Nor ſhall

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[*] *Leuwenhoek*'s Arcan. Nat. Tom. iii. Ep. 111. Nieuwentit. Exiſt. liv. 2. c. 7.

[†] Eight thouſand at leaſt, according to *Leuwenhoek*'s Experim. and Contempl. Ep. 83.

[||] *Leuwenhoek*, ibid.

[‡] Obſervations de Puget.

The Sponges. forget the double Packet of Sponges, placed below, at the Juncture of its Claws. Some Naturaliſts ſuppoſe, that when this Animal marches over any poliſhed Body, on which neither her Claws nor Points can faſten, ſhe ſometimes compreſſes her Sponge, and cauſes it to evacuate a Fluid, which fixes her in ſuch a Manner as prevents her falling, without diminiſhing the Facility of her Progreſs. But it is much more probable that the Sponges correſpond with the fleſhy Balls, which accompany the Claws of Dogs and Cats; and that they enable the Fly to proceed with a ſofter Pace, and contribute to the Preſervation of its Claws, whoſe pointed Extremities would be ſoon impaired without this Prevention. Beſide theſe Sponges, her Paws are ſhaded with a Growth of Hair, which ſhe employs inſtead of a Bruſh to clean her Wings and Eyes.

Chev. I have been ſometimes very much delighted to ſee her perform this Piece of Exerciſe. She firſt cleans her Bruſhes, and then rubs one Paw againſt the other, and afterwards draws them, firſt over her Wings, and then under; concluding the Whole with bruſhing her Head. But what Occaſion has ſhe to repeat the ſame Work ſo often?

Prior. Cleanlineſs is her indiſpenſable Care, and ſhe knows, that were it not for this Precaution, Duſt and Smoke, as well as Rain and Fogs, would cloud her Eyes, as well as ſettle on her Wings, and incumber her delicate Body. But we interrupt his Lordſhip.

The Trunk. *Count.* Her Trunk is compoſed of two Parts, one of which folds over the other, and both of them are ſheathed in her Mouth. The Extremity of this Trunk is ſharp like a Knife, to enable her to cut what ſhe eats. She likewiſe forms it into two Lips, that ſhe may the better take up proper Quantities of Food; and when ſhe ſucks up the Air it contains, ſhe employs it, as a Pump, for drawing up Liquors. Several Flies, at the other Extremity of their Body, are furniſhed with a Piercer *, above three

The Piercer. Twelfths of an Inch in Length, with which they penetrate wherever they pleaſe, and then ſheath it between their Scales. This Inſtrument conſiſts of ſeveral Parts, as particularly one or two Saws finely pointed at the End, and well indented thro' the whole Length; a long Caſe to encloſe them; a Syſtem of Muſcles, to unſheath them; and a Set of Fibres, to bring them back to their Socket. Its laſt Piece of Furniture is a Bag of corroding Water, to eat into the Cavities that have been firſt opened by the Saws.

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* Leuwenhoek's Arcan. Nat. Tom. iii. Ep. 136. and Tom. ii. Ep. 64.

Thoſe Flies that penetrate the Leaves of the Oak, are furniſhed with ſuch a Piercer, as I have already deſcribed.

Thoſe, whoſe Punctures are ſeen in the Bark of * Roſe Trees, have one of a very different Structure. It is formed into a long Tube, which terminates in a bending Point, like a pruning Knife, and is accompanied, through its whole Length, with ſeveral Ranges of Teeth. The Fly firſt traces out, with the ſharp Part of this Inſtrument, a ſmall Furrow, on the Branch of a Roſe Ttee, after which, ſhe places the long indented Tube on that Furrow, and then, by twining and returning the whole Inſtrument, ſhe opens on all Sides, a Number of Cells, which appear like Ranges of Teeth, diſpoſed in Pairs, along the Extent of a Line that ſeparates them.

The ſame Tube likewiſe enables her to depoſite an Egg in each Cavity, and when the Heat has at laſt hatched the little Worm in the Egg, it quits its Manſion, to gnaw a Leaf of the Roſe Tree, and gradually increaſes in Growth, like a ſmall Caterpillar. The Animal, at the End of ſix Weeks, and after it has frequently changed its Skin, ceaſes to eat, and deſcends to the lower Part of the Tree, where it ſpins a Covering around its Body. The Fly, contained in this Worm, endeavours to force itſelf a Paſſage through the Skin of that Creature, and accompliſhes her Purpoſe by Degrees. The Skin of the Worm cleaves open, and ſhrinks with the Head and Inteſtines, that are now become uſeleſs. The Fluid in which the Fly ſwims, and which might poſſibly contribute to its Diſengagement from the Worm, begins to dry all around the new Animal, and is then converted into a Kind of Bag or Shell, which makes the Fly ſeem in a State of Inactivity, and even without any Symptoms

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* Valliſneri la Moſca de Roſai.

toms of Life. She either continues but a ſhort Space of Time in the State of an Aurelia, or elſe paſſes the whole Winter in that Situation, according to the Degree of Heat ſhe then experiences. Theſe few Inſtances, Sir, will enable you to judge of the Inſtruments with which each Species is accommodated, and of the various Changes through which they paſs.

The common Fly, inſtead of a Piercer qualified for penetrating Wood, has only a Tube, with which ſhe depoſites her Eggs, in Fleſh that has been ſoftened by Heat, and likewiſe in all Subſtances that are ſucculent or milky, and ſalted but little; becauſe the ſharp Particles of Salt are more apt to tear the tender Organs of her Young, than contribute to their Preſervation. From theſe Eggs proceed a Brood of Worms, who, afterwards change to Aurelia's, and then to Flies; I omit the Conſequences of their extreme Fecundity, and ſhall only obſerve, that neither the Lion's Throat, nor the Wolf's Teeth, nor all the Horns and Fangs of wild Beaſts, in their united Rage, are ſo pernicious to Man, as this little Piercer, which Nature has beſtowed on a common Fly, to dig a Repoſitory for her Eggs. The Caſe is not the ſame with Ichneumon Flies, and ſeveral other Species; for they are in ſome meaſure beneficial to us. The Generality of theſe Creatures ſuſtain and ſhelter themſelves in ſome particular Plant, and it is to their Solicitude to lay their Eggs there, that we owe both the Invention and Materials of the fineſt Colours, uſed either in Dying or Painting, as alſo the deepeſt Black, common Ink, Scarlet, Vermilion, and many more.

Counteſs. I have always heard that Ink was a Compoſition of Vitriol, and Gall-Nuts gathered from Oaks, and that the Scarlet Dye was produced from Cochineal, or Scarlet Grain: And I don't in the leaſt comprehend, what Uſe can be made either of Ichneumon Flies, or their Piercer.

The Origin of the Gall-Nut.

Count. 'Tis this: There is a Species of Flies * who chuſe to depoſite their Eggs in the Oak, preferably to any other Tree, and with the Inſtrument I have been deſcribing, pierce into the Heart of a Leaf, and frequently to the Bud itſelf, whilſt it is yet tender, and then with their Saw penetrate to the very Pith. At the ſame time, ſhe injects into this Cavity, a Drop of her corroding Liquor, and immediately lays an Egg, and ſometimes ſeveral, there. The Heart of the Bud being wounded in this Manner, the Circulation of the nutritious Juice is interrupted, and by the Mixture of the Poiſon infuſed by the Fly, is thrown into a Fermentation that burns the contiguous Parts, and there changes the natural Colour of the Plant. The Juice or Sap, turned from its proper Channel, extravaſates and flows round the Egg. After which it ſwells, and is dilated by the Spring of ſeveral little Bubbles of Air, that enter through the Pores of the Bark, and float in the Veſſels with the Sap; its Surface is dried by the external Air, and hardens in a Form that reſembles the Bending of a Vault, or the Roundneſs of a Kernel. This little Ball gradually receives its Nouriſhment, Growth, and Vegetation, like the other Parts of the Tree, and is what we properly call the Gall-Nut.

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* Malphigi de Gallis.

The Worm that is hatched under this ſpacious Roof, finds in the tender Subſtance of the Ball, a Suſtenance accommodated to its Nature; it eats and digeſts it, till its Transformation, firſt into a Nymph, and then into a Fly: After which, finding itſelf furniſhed with all its Equipage, it pierces through the Incloſure, and launches into the open Air.

You may eaſily be convinced of the Truth of this Account; examine the Gall-Nuts that grow at the Beginning of Summer, and you will immediately ſee them pierced through; becauſe the Warmth of the Seaſon has advanced the Egg, the Nymph, and the Fly to Maturity. If, when you open them, you ſhould find a little Spider there, don't imagine ſhe came from the Egg of a Fly; for when this Inſect quits the Gall-Nut, the Place does not ceaſe to be uſeful; a ſmall Spider generally ſlides into the Cavity, and finds a Space already prepared for her Habitation, and there ſpins her Web, in Proportion to the Dimenſions of the Cell, where ſhe enſnares the minute Inſects that venture into her Territories.

But the Caſe is not the ſame with the Gall-Nut that grows in Autumn. The Cold frequently comes on before the Worm is changed into a Fly, or before the Fly can diſengage itſelf from its Confinement. The

Nut falls with the Leaves, and, I ſuppoſe, you imagine the incloſed Inſect to be deſtroyed; but the Fact is quite otherwiſe, and her very Covering contributes to her Preſervation. In this manner ſhe paſſes the Winter, well lodged, and calked up, in the Shell of the Nut, and even buried under a Heap of Leaves that preſerve her from all Injury. But this Manſion, that proves ſo commodious in the Winter, is a Priſon in the Spring; and the Fly, awakened by the firſt Heats, opens herſelf a Paſſage, and expatiates in full Liberty. A ſmall Aperture ſuffices her, becauſe, at this time, her Bulk is very inconſiderable, and beſide this, the Rings which compoſe the Body, lengthen, and become pliable in her Paſſage.

Chev. Your Lordſhip enables me to comprehend the Reaſon, why we find a Worm under the hard Shell of a Filberd, or a ſmall Nut. It undoubtedly proceeds from an Egg left there by a Fly, when the Fruit was tender, and one always ſees the Orifice made by the Piercer, through which the Inſect injected her Egg.

Count. If this Orifice ſhould be cloſed up, as it is in Fruits, Peaſe and Beans, it is becauſe the Flow of the Sap into the Wound ſtops it up by Degrees. The Worm when ſhe forſakes the Egg, finds in the hollow of the Kernel, or the Heart of the Fruit, a Solitude where nothing can incommode her, and has alſo a Supply of Proviſions, in whoſe Property ſhe has no Competitor. She works there with her Teeth, and Feet, in full Eaſe, and thrives to Admiration, till finding her Wings unfolded, the Love of Liberty and Pleaſure prompts her to make an Opening in the Wall, and then ſhe ſallies out to ſeek Company.

Chev. You make this ſolitary Act a very pleaſant Part.

Counteſs. This Explication of the Original of a Gall-Nut, frees me from a great Perplexity. I was in Pain to know, whether the Oak which produced the Acorn, did not likewiſe bear another kind of Fruit of a very different Nature; but I am now convinced, that theſe Nuts are no more than Excreſcencies, occaſioned by the Puncture made by an Inſect.

Count. They are called Nuts, without any manner of Reaſon. It is true, they have ſomething like a Kernel, and are gathered from a Tree; but then they have only a falſe Appearance of a Nut or Fruit, without being either the one or the other. There is hardly any Plant, but what is pierced in the ſame manner by ſome Inſect, and which produces ſome of theſe pretended Nuts, of all Sizes and Colours. Some Trees have their Leaves entirely cruſted with them, but they are not called by any particular Name, becauſe they are never uſed; but it is poſſible, that thoſe which grow on the Plane Tree, the Poplar, the Willow, the Box, and Ivy, would afford very rich Colours, were People diſpoſed to make the Experiment.

Counteſs. Is it not the ſame with Cochineal, as it is with the Gall-Nut?

Count. Cochineal is neither a Fruit, nor a Gall-Nut, formed by the Puncture made by an Inſect; * but it is the Inſect itſelf who pierces the Cochineal Tree. This Plant, which in *New Spain* is called the Nopal, is a Species of the Fig-Tree; the Leaves are thick, full of Juice, and thorny. The Inhabitants who cultivate it, ſweep from the Leaves, at the Approach of the rainy Seaſon, ſeveral little Inſects, that ſuck the Green Plant. They preſerve them in their own Houſes, and nouriſh them with the Branches of the Nopal. When they are grown ſtrong, and the Rains are over, they put twelve or fourteen of them into little Panniers made of Moſs, or the Down that covers the Cocoa-Nut. Theſe Panniers they place on the Nopal, and the Cochineal Inſects, in a few Days, give Birth to an infinite Number of Young. The Dam lives but a ſhort Time after they have laid their Eggs, and are what may be called the firſt Produce. The Young forſake the Panniers, and diſperſe themſelves over all the Verdure of the Nopal, and thrive to that Degree, in the Space of three Months, as to be prolific in their Turn. The ſecond Brood are permitted to live, but all the Parents are carried home and killed; the new Off-ſpring on the Tree have likewiſe their Young, at the End of three or four Months; but leſt they ſhould all be deſtroyed in the rainy Seaſon, the Inhabitants carry home the Dams, as well as their Off-ſpring; and this is the third Produce. A ſufficient Number of the young Inſects are preſerved, to continue the Species the next Year, and all the reſt are killed in hot

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* Hiſt Nat. de la Cochenille verifiée par les atteſtations des Juges de la Province d'Oxaca; Amſt. 1729.

Water, or Ovens, or upon flat Stoves, on which the *American* Women bake their Bread. The Inſects, * that are deſtroyed in hot Water, are of a brown Colour, inclining a little to red; thoſe who are killed in the Oven, are of an Aſh Complexion, and ſtreaked like Marble, and ſuch of them as expire on the Stove, are black, and ſeem burnt. Their Inſide is filled with a beautiful red Duſt. Theſe Inſects are ſent to us dried, and half reduced to a Powder, in which, without the Aſſiſtance of a Microſcope, one may diſtinguiſh an oval Body, Scales and Paws, or little Pieces of them bruiſed, and a ſmall pointed Trunk.

The Lack, which produces the fineſt Red, is a reſinous Gum, gathered by Flies, or winged Piſmires from different Flowers, † and this they depoſite, either on the Branches of a Tree, or on Poles, which are preſented to them by the Country People, with an Intention to profit by their Labours.

The Drain of Kermes, or Scarlet, is a little red Shell, formed by the Inſect that pierces the Green Oak, or ſmall Holm-Tree; and when the gathering of their Shells has been too long neglected, a particular Species of Flies make ſmall Punctures in them, and ſlide in their Eggs, which produce Worms and Flies; but theſe are not to be confounded with the little Vermin that live with their young, in the Cavity of this Shell. Other Tribes of Flies and Inſects, are likewiſe at Work upon all our Plants. We indeed are not curious enough to make any Experiments on what they offer us, and perhaps take long Voyages to the *Indies*, for Commodities that are daily preſented to us at Home.

Chev. We are charmed, my Lord, with your Flies; but are the Gnats too as curious in their Kind?

Count. Their Uſefulneſs perhaps is not ſo great, but their Transformations are more extraordinary. Let us take a Turn along the Mote of the Caſtle. I have diſcovered what we want. Stoop down a little, *Chevalier*, towards the Root of that Tree which ſhoots into the Water. What do you diſcover on the Surface of the Mote, cloſe by the Root?

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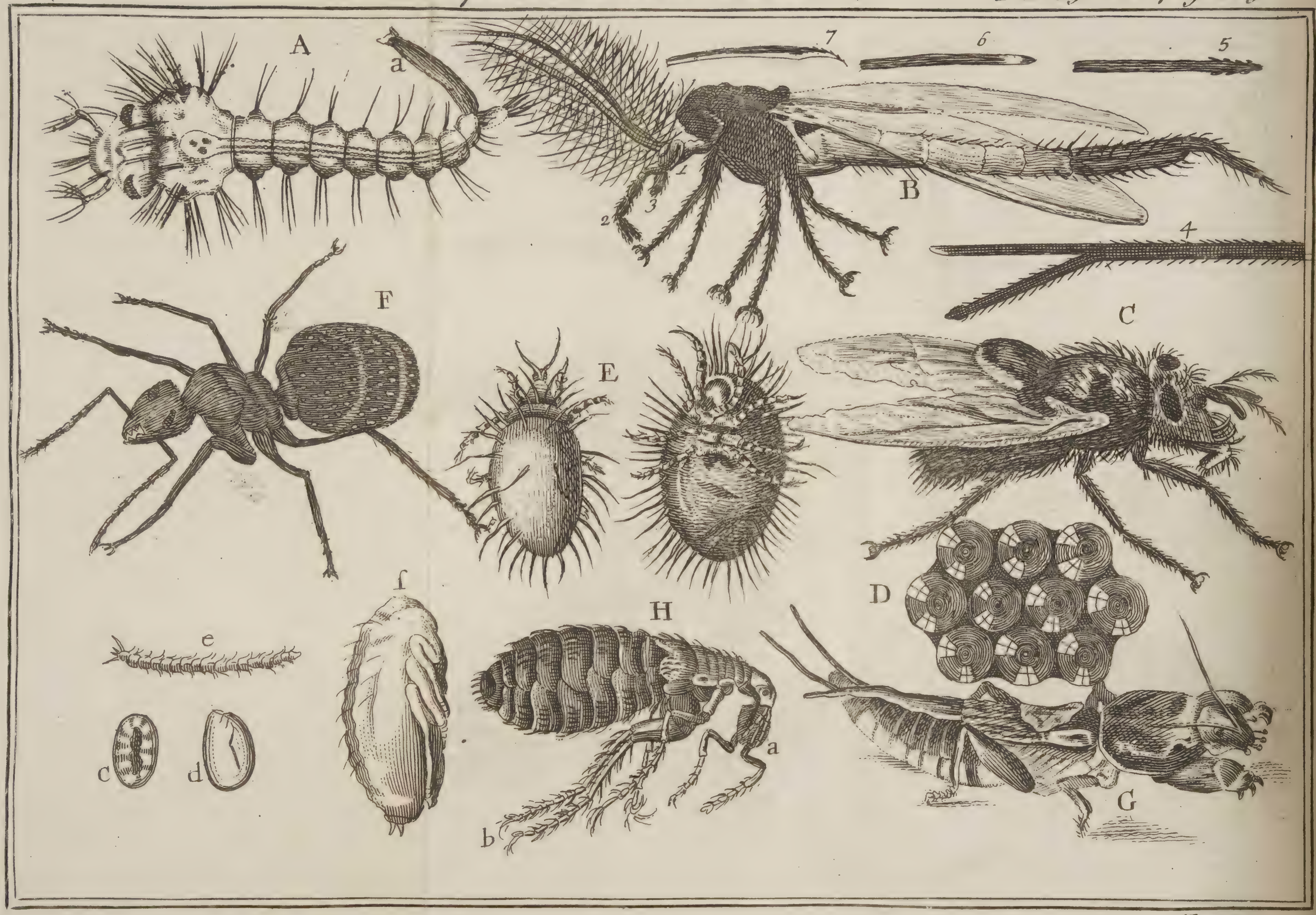
* Harwoek Eſſai de Diopt. p. 52. Paris 1694.

† Memoirs de l'Acad. des Scienc. M. Geoffroi, le Jeune, 1714.

Chev.

Gnats and other Insects

Plate 15 Vol. I page 123



Toms sculp.

Chev. I ſee ſomething like a little Sieve, faſten'd at one End to the Stump of the Root.

Count. That Sieve is a ſmall Piece of Glew, ſuſtained by the Water, and the pretended Holes of the Sieve, are Eggs properly ranged upon the Glew, * to prevent them from ſinking; and the Faſtening which joins it to the Root preſerves the Whole from being carried away by the Winds, to any other Situation that might prove too cold, and where the Eggs, for want of Sun-ſhine, could not be hatched.

Chev. What Animal has taken all theſe wiſe Precautions?

Count. 'Tis the Work of Gnats, who are ſo well known by their Buzzing, and ſharp Stings.

Chev. How! does the Gnat, who lives upon the Earth, and in the Air, lay her Eggs in the Water?

Count. Have you not frequently ſeen Gnats flickering along the Surface of ſtanding Waters? They are fond of that Neighbourhood, becauſe there they rear their beloved Family. I grant there are other Species, that ſeem to be born in the deep Receſſes of Woods, and probably at a great Diſtance from the Water; but I will give you the Hiſtory of thoſe that have come to my Knowledge, in a few Words.

From the Eggs ſtrewed over a Bed of Glew, on the Edge of the Water, proceeds a Brood of little Animals who paſs through three different States. They are firſt Inhabitants of that fluid Element; they then change from aquatick to amphibious Creatures, living both in the Air and Water; and at laſt confine themſelves entirely to the Air.

Their three States.

In their firſt State they are Aquaticks, in which Period they wear the Form of minute Worms, and make themſelves little Lodgments of Glew, which they faſten to ſome ſolid Body, at the very Bottom of the Water, unleſs they meet with any Chalk; which, being more pliant and ſoft, permits them to ſink a Habitation in its Entrails, where they are defended from the Teeth of Fiſhes, but not from the Claws of Cray-fiſh.

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* Hiſt. des Inſ. par Swamm.

This Worm, in Proceſs of Time, is diveſted of its Form, and acquires a large Head, and a Tail ſhagged with Hair, and moiſten'd with an oily Fluid, that, like a Cork, aſſiſts her to ſuſtain and tranſport herſelf from Place to Place, her Head ſometimes raiſed in the Air, and ſometimes plunged in the Water, and her Tail ſliding on the Surface. If the Oil, with which her Tail is lubricated, begins to dry up, ſhe diſcharges an unctuous Humour out of her Mouth, and ſheds it over her Tail; this reſtores it to its Faculty of ſteering her where ſhe pleaſes, without being moiſtened, or prejudiced by the Water.

The Gnat, in her ſecond State, is properly in the Form of a Nymph, which transfers her to a very different Condition of Life: She immediately diſrobes herſelf of her ſecond Skin, reſigns her Eyes, Horns, and Tail; but, from the Ruins of the amphibious Animal, a little winged Inſect ſprings into the Air, with a Body actuated by a ſurpriſing Agility, and conſtituted with the fineſt Texture of Limbs, the Head is beautified with a delicate Plumage, and all the Body inveſted with Scales and Hair, to defend it from Humidity and Duſt. She tries the Activity of her Wings, by rubbing them againſt her Body, or two Bags which hang at her Sides, to poiſe her in an equal Motion. The Furbelow of little Plumes that border thoſe Wings, are admirable in their Kind.

The Trunk.

But nothing is more precious in the Equipage of a Gnat than her Trunk, and one may venture to ſay, this feeble Inſtrument is one of the greateſt Wonders of Nature; it is ſo extremely minute, that the beſt Microſcopes hardly give us a View of its Extremity †. What is firſt diſcoverable, is a Caſe compoſed of long Scales, that ſhe carries under her Throat, and which, at about the Diſtance of two thirds of its Extent, has an Opening thro' which ſhe launches four Darts, and then returns them into their Quiver: One of theſe Darts, as pointed and active as it is, performs the Office of a new Caſe to the other three, which are there ſheathed in a long Groove, and have their Sides ſharpened like fine Swords; they are likewiſe barbed, or thick ſet, with cutting Teeth, towards the Point, which is a little hooked, and whoſe Fineneſs is inexpreſſible. When all theſe Stings are darted into the Fleſh of Animals, and make their Wounds ſometimes one after another; and ſometimes in Conjunction, the Blood and Humours of the adjoining Parts muſt unavoidably be forced out of their Veſſels, and cauſe a Tumour in the Inciſion, whoſe little Orifice is cloſed by the Compreſſion of the external Air.

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† Leuwenhoek, Arcan. Nat. Exper. & Con. Ep. 69.

When the Gnat, by the Extremity of her Sheath, that ſerves her inſtead of a Tongue, has found out any Fruits, Fleſh, or Juices ſhe has been ſeeking; if it happen to be a Liquor, ſhe ſucks it up without ejecting her Lancets; but if ſhe meets with Fleſh that reſiſts her Efforts, ſhe ſtings very ſeverely, and then ſheaths her Weapons in the Scabbard, which ſhe applies to the Orifice of the Wound, and, through the Cavity draws up the Juices ſhe finds there.

This is the Inſtrument with which the Gnat is accommodated for Summer Work; but, in the Winter Seaſon, ſhe is releaſed from the Care of obtaining Proviſions; for then ſhe ceaſes to eat, and paſſes all that melancholy Seaſon in Caves and Quarries; which, at the Return of Summer, ſhe forſakes, and takes her Flight in Queſt of a ſtanding Water, where ſhe may have an Opportunity to perpetuate her Family, who would ſoon be hurried away by the Rapidity of a running Stream. The little Progeny are ſometimes ſo numerous, that the very Water is coloured, according to the Complexion of the Species. When they are green, it exhibits the ſame Tincture; as it deepens into a ſanguine Dye, when the Inſects happen to be red. 'Tis now the *Prior*'s Turn to favour us with an Account of the Grillotalpa.

The Form of the Grillotalpa.

Counteſs. The Sound of that hard Word ſhocks my Ear, why don't you give it the Air of our Language? Is not this the Animal I have ſeen in your Cloſet, ſtretch'd on a green Turf, and covered with a little chryſtal Vaſe. The Creature is near three Inches long, has two Horns before, and as many behind, to give it Intelligence of all that paſſes amidſt the Darkneſs in which ſhe reſides: She has likewiſe a Couple of ſtrong, ſhort Wings, and two that are very long; a large Coat of Mail on her Back, and two Arms fortified with a couple of dreadful Saws.

Count. 'Tis the very ſame.

Counteſs. I think I have heard it called a Mole-Cricket; becauſe it lives under Ground, like a Mole, and imitates the Chirping of a Cricket; and this is the Name I would chuſe to give it.

Prior. The Ladies have a greater Privilege than our Sex, in the Uſe of new Words, and her Ladyſhip's Authority may give a Currency to this Term; we will therefore truſt to the Event.

Count. With the *Prior*'s Leave we will walk to a Corner of the Parterre, where you will find a Neſt of theſe Mole-Crickets. You ſee I have Intelligence of all that paſſes here. Each Tribe of Animals is at work for me. This is the Place.

The Neſt of Eggs.

Prior. Let us take a Spade, and ſhew the *Chevalier* a Clod of cemented Earth, in the Heart of which he will find * a little Apartment capable of containing two Filberds, and there all the Eggs are lodged. Let us open it gently, and be careful we don't break any Thing. That, Sir, is the Clod I was ſpeaking of, you ſee it appears as large as an Egg, and is ſurrounded with a little Trench. Take it up and cut it through the middle. You will find the Entrance into the Chamber has been cloſed up.

Chev. 'Tis very true. What a prodigious Number of Eggs are lodged in the Cavity! Let me count them. I find an hundred and fifty. But why are they laid there?

Prior. Were the Eggs covered with leſs Caution, or ſhould the leaſt Breath of Air be admitted to them, they would be deſtitute of the neceſſary Warmth, and the whole Poſterity would be deſtroyed. Beſide this, the Mole Crickets are obliged to ſtop up, with ſo much Exactneſs, the Mouth of the Cell where they lay their Eggs, and to ſink a Trench all around it, becauſe there is a little black Animal, a mortal Enemy to their Species, who opens himſelf a Paſſage under Ground, and endeavours to devour their Eggs and Young; to prevent which, one of the Tribe perpetually keeps Centry on the Bank of the Trench, and when the black Animal plunges himſelf in to ſeek his Prey, he is immediately cut ſhort, and the Neſt, by this Precaution, is delivered from its Invader. If the Centinel finds himſelf aſſaulted by too many Enemies, he then throws himſelf into theſe winding Paths, you ſee ſtruck out under Ground, and ſo evades the Danger. But I am now coming to the moſt ſingular Piece of Dexterity we have obſerved in the Conduct of theſe Animals, and which we diſcovered by the Aſſiſtance of a Glaſs Bell, under which we reared ſome of theſe Creatures, in a Quantity of Earth ſufficient to furniſh us with our Obſervations.

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* Godart.

At the Approach of Winter, the Mole Crickets remove the Reſervoir which contained their Eggs, and ſink it very deep in the Earth, always taking care to dig it lower than the Froſt can penetrate. When the mild Seaſon comes on, they raiſe the Magazine, in Proportion to the Advances of that favourable Period, and at laſt elevate it as near the Surface, as will be ſufficient to make it ſuſceptible of the Impreſſions of Air and Sun-ſhine: And ſhould the Froſt return, they again let it down to its proper Depth. The ſame Method is practiſed by the Ants, whoſe Hiſtory I am now to give you; for I am not ſufficiently acquainted with Mole-Crickets, to entertain you any longer on that Subject. But before I begin, I would aſk the *Chevalier*, whether we are to viſit the Ants, in the Quality of indolent Perſons, for Inſtruction, or, in the Capacity of Connoiſſeurs, for Admiration?

Ants.

Chev. I underſtand you perfectly well, Sir, and have been informed by the *Proverbs* of *Solomon* *, that the Idle ought to go to the Ants, to learn how to be provident. Perhaps I am no Sluggard; but yet where is the Perſon who has no Occaſion to be taught a prudent Forecaſt?

Prior. The Sight of Ants is really very inſtructive. They are a little People united, like the Bees, in a Republick govern'd by its own Laws and Politics †. They have a Kind of oblong City, divided into various Streets, that terminate at different Magazines ‡. Some of the Ants conſolidate the Earth, and prevent its falling in, by a Surface of Glew with which they incruſt it. Thoſe whom we commonly ſee, amaſs ſeveral Splinters of Wood, which they draw over the Tops of their Streets, and uſe them as Rafters to ſuſtain the Roof; and acroſs theſe, they lay another Rank of Splinters, and cover them with a Heap of dry Ruſhes, Graſs, and Straw, which they raiſe with a double Slope, to turn the Current of the Water from their Magazines; ſome of which are appropriated to receive their Proviſions, and, in the others they depoſite their Eggs, and the Worms that proceed from them.

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* Prov. vi. 6.

† Aldrovand. de Formicis. Johnſton. Thaumaturg. Nat. p. 356.

‡ Hiſtory of the Buccaneers; towards the End.

Their Streets.

Magazine.

As to their Proviſions, they take up with every Thing eatable, and are indefatigable in bringing home their Supplies. You may ſee one loaded with the Kernel of ſome Fruit, another bends under the Weight of a dead Gnat. Sometimes ſeveral of them are at work on the Carcaſs of a May-Fly, or ſome other Inſect. What can't be remov'd they eat on the Spot, and carry home all that is capable of being preſerved. The whole Society is not permitted to make Excurſions at random. Some are detached as Scouts, to get Intelligence, and according to the Tidings they bring all the Community are upon the March, either to attack a ripe Pear, a Cake of Sugar, or a Jar of Sweetmeats; and in order to come to this Jar, they leave the Garden, and aſcend the Houſe; there they find this Mine of Sugar, this rich *Peru* of Sweets, that opens all its Treaſures to their View; but their March to it, as well as their Return from it, is under ſome Regulation. The whole Band is ordered to aſſemble, and move in the ſame Track, but the Injunction is not executed with much Severity, and they have Liberty to expatiate, when they have an Opportunity to ſpring any Game in the Country. The green Vermin, that make an infinite Waſte among the Flowers, and cockle the Leaves of the Peach and Pear Trees, are ſurrounded with a Glew, or Kind of Honey, which is ſought for by the Ants with great Avidity; but they are not ſollicitous either for the Fleſh of theſe Creatures, or for any Part of the Plant. Theſe are the Vermin who are the Authors of all that Deſtruction to our Trees, which is falſely imputed to the Ants, and draws upon them a very unjuſt and cruel Perſecution.

Proviſions.

Their next prevailing Paſſion is, to amaſs a Store of Corn, or other Grain that will keep; and leſt the Humidity of the

Cells ſhould make the Corn ſhoot up, we are told, for a Certainty, that they gnaw off the Buds which grow at the Point of the Grain.

I have ſeen Ants carry, and ſometimes puſh before them, Grains of Barley and Wheat, much larger than themſelves; but I never could find out their Granary. All the Ancients mention it, and *Aldrovandus* aſſures us he had ſeen it. Their Labours, as well as their Inclinations, may vary according to their Species. 'Tis likewiſe probable that their Aurelia's, which are ſometimes yellow, have been taken for Grains of Corn without Buds, and ſwelled by Moiſture.

The Ants, after they have paſſed the Summer in a conſtant Employment and Fatigue, ſhut themſelves up in the Winter, and enjoy the Fruits of their Labours in Peace; however, it is very probable, they eat but little in that Seaſon, and are either benumbed, or buried in Sleep, like a Multitude of other Inſects. And therefore their Induſtry in ſtoring up Proviſions, is not ſo much intended to guard againſt the Winter, as to provide, during the Harveſt, a neceſſary Suſtenance for their Young. They nouriſh them as ſoon as they leave the Egg, with an Aſſiduity that employs the whole Nation; and the Care of their little Progeny, is eſteemed a Matter of Importance to all the State.

When the Young quit the Egg, they are little Worms, no longer than common Grains of Sand *, and after they have, for ſome time received their Aliment, which is brought to them in common, and diſtributed in equal Proportions, they ſpin a Thread, and wrap themſelves up in a white Web, and ſometimes in one that is yellow; at which Period they ceaſe to eat, and become Aurelia's. In this State, ſome People fancy they are the Eggs of Ants, when, in Reality, they are the Nymphs, out of whoſe Ruins the new Piſmires are to riſe. Though the Young diſcontinue their eating, their Nurture ſtill proves very fatiguing to their Parents. Theſe have generally ſeveral Apartments, and remove their Young, from the Nurſery, to ſome other Manſion which they intend to people. They either raiſe the Aurelia's toward the Surface of the Earth, or ſink them to a diſtance from it, in Proportion as the Seaſon is either warm or cold, rainy or dry *. They raiſe them when the Weather proves ſerene, or when a long Drought is ſucceeded by gentle Dews; but, at the Approach of Night and Cold, or the Appearance of Showers, they claſp their beloved Charge in their Arms, and deſcend with them to ſuch a Depth, that one muſt then dig above a Foot into the Earth, before thoſe Aurelia's can be diſcovered †.

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* Leuwenhoek's Arcan. Nat. Tom. i. & iii. Ep. iii.

We might enlarge on many other Particulars of their Conduct, ſuch as their diſperſing themſelves over the Country, their Cuſtom of removing the Dead from their Habitations, their Promptitude in aſſiſting each other to carry their Burdens, or invade their Enemies. A long Deſcription might likewiſe be given of the ſmall Sting they carry in the Extremity of their Bodies, with a Bag of corroding Water that cauſes little Tumours. Much might be alſo ſaid of their Wings, that are acquired by the Males, at a certain Age, to facilitate their Acquiſition of Food, and which are refuſed to the Females, ** that they may be more ſedentary, and better devoted to domeſtic Cares; but the Subject the *Chevalier* has choſen for our Entertainment is ſo extremely agreeable, that it would be an Injury to the Company, to deprive them any longer of ſo much Pleaſure.

Chev. After the Hiſtory of the Ant, the moſt natural Tranſition is to that of the Formicaleo, ſo called, becauſe it is the Lion, or moſt formidable Enemy to the Ant.

Counteſs. Rather call it the Lion Piſmire. We are Maſters of the Terms, at leaſt in our Academy.

Chev. That Name is perfectly agreeable, and I ſhall never call this Creature by any other. I yeſterday ſaw a pretty Picture of one of them, in the *Prior*'s Apartment, that repreſented all the Changes thro' which the Creature paſſes. I am tolerably well acquainted with the whole Train of Particulars ‡, but, that I might not fatigue the Company with frequent Heſitations, and leſt I ſhould forget

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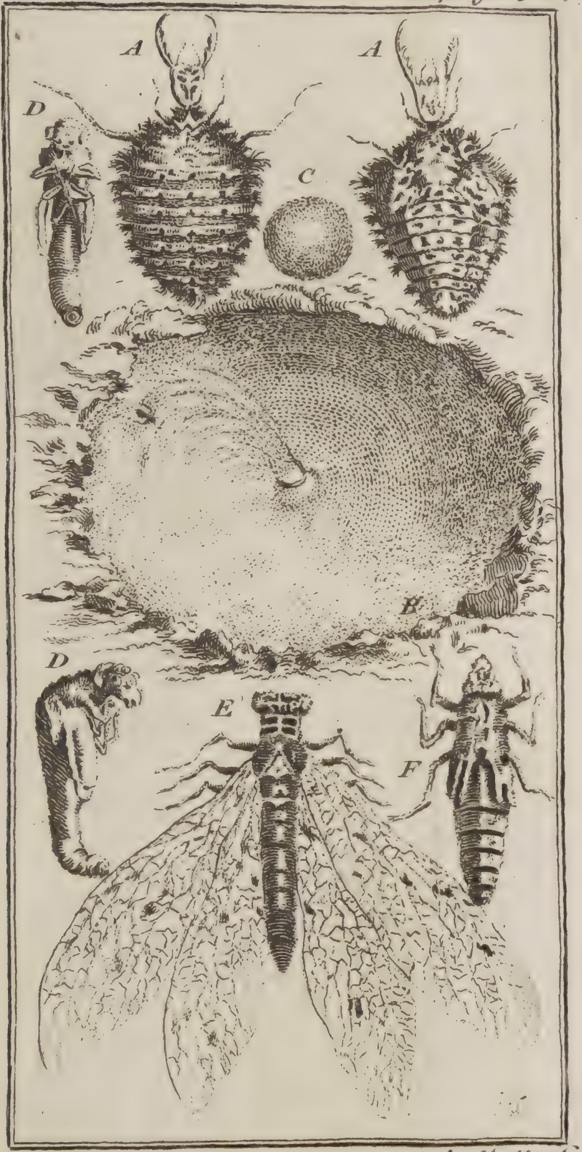
* Hiſt. Gener. des Inſect par Swamm. p. 162.

† Lowthorp's Abridgment, Tom. ii. p. 7. & 9.

** I think, however, that I have obſerved the whole Tribe of an Ant-hill furniſhed with Wings, and forſaking their ſubterraneous Abode.

‡ M. Aubriet deſſinat. au Jardin Royal.

Plate 16 Vol. I page 131.



A. Motte ſc.

The Lyon Pismire

get any neceſſary Circumſtance, I have committed the whole to Writing, and this Morning communicated it to the *Prior*, who has touch'd it up with his own Hand; which I deſire may be remembered.

Counteſs. The Gentleman delivers himſelf in ſuch a natural Air, as is worthy to introduce the moſt entertaining Hiſtory.

Lion Piſmires.

Their Shape.

Inſtruments.

Chev. The Lion Piſmire is as long as the common Palmer *, but ſomething thicker; it has a very long Head, and the Body grows round as it lengthens towards the Tail. The Animal is of a dark Grey, marked with black Spots. Its Body is compoſed of ſeveral flat Rings, that ſlide over one another. It has ſix Feet, four of which are inſerted in the Breaſt, and two in the Neck. Its Head is ſmall and flat, and from the fore Part of it, two little Horns ſhoot out: Theſe are ſmooth and hard, extend two Twelfths of an Inch in Length, and bend like Hooks in the Extremity. Towards the Baſe of theſe Horns, appear two ſmall Eyes, very black and lively, and which are extreamly ſerviceable to the Creature, for he ſtarts from the ſmalleſt Objects he diſcovers. Other Animals are furniſhed with Wings, or Feet at leaſt, to make them expeditious in the Purſuit of their Prey; but this is only capable of marching backwards. He never follows his Prey, and would ſooner dye than advance a Step towards it. The Prey muſt come to him, and he is gifted with the Secret of making it fall into the Ambuſcade he has prepared. This is the only Method he has for his Subſiſtence, and is all the Science he is Maſter of; but however it ſuffices for his Purpoſe.

The Trench.

He chuſes for himſelf a Bed of dry Sand, at the Foot of a Wall, or under ſome Shelter, that the Rain may not diſconcert his Work. He is obliged to make uſe of Sand, and of the dryeſt he can get, becauſe a ſolid Soil, as well as a moiſt Sand, would not prove tractable under his Operations. When he intends to hollow the Trench where he enſnares his Game, he bends the hinder Part of his Body, which tapers into a Point, and then plunges it, like a Ploughſhare, into the Sand, which he throws up in his Rear, with a backward Motion of his Body; and thus, by repeating his Efforts, and taking ſeveral Rounds, he at laſt traces out a circular Furrow, whoſe Diameter always equals the Depth to which he intends to ſink it. Near the Edge of the firſt Furrow, he opens a ſecond, and then a third, and ſeveral others, which are ſmaller than the preceding, and ſinks himſelf from time to time, deeper in the Sand, which he throws aſide with his Horns, on the Edges of the Furrows, and to a much greater Diſtance, always marching backward in a ſpiral Line. The repeating Strokes of his Head, whirl the Sand out of the Circle, and gradually ſcoop out a Cavity, in which Operation he exceeds the beſt Engineers; He deſcribes a perfect Circle, and draws out a Volute, without the Aſſiſtance of a pair of Compaſſes. He likewiſe gives the Slope of Earth which he hollows, all poſſible Solidity. In this dexterous and indefatigable Manner he compleats his Trench, which reſembles a Cone reverſed, or rather the inſide of a Funnel.

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* Memoirs de l'Academ. des Scienc. Monſieur Poupart, 1704.

When this Creature is newly hatched, he opens a very ſmall Furrow, but when he increaſes in Bulk, he digs one more ſpacious, the Cavity of which may contain two Inches or more in Diameter, and as many in Depth. When the Work is compleated, he forms his Ambuſcade, and conceals himſelf under the Sand, in ſuch a Manner, that his Horns exactly wind round the Point in which the Bottom of the Funnel terminates. In this Situation, he watches for his Prey, and woe to the Ant, the Palmer, or any other Inſect who is ſo indiſcreet as to play round the Edge of this Precipice, which deſcends in a Slope, and that too in the Sand, to give a Downfal to the little Animals who are too incautious in their Approaches. 'Tis for the female Ant that the Lion-Piſmire thus adjuſts his Kitchen. She is not aided with Wings, like the Generality of Inſects, to diſengage herſelf from this Cavern, but then ſhe is not the only Prey, for other Animals are alſo deſtroyed by the Dexterity of this Hunter. When he knows by the fall of ſome Grains of Sand, that a Prize is near, he ſhrinks back and moves the Sand which immediately rolls to the Bottom with the Prey. If this Prey has Agility enough to be capable of remounting in an Inſtant, and, with this Advantage, is likewiſe aſſiſted with Wings, the Lion-Piſmire whirls a Quantity of Sand into the Air, above the Height of the flying Animal. This is a dreadful Shower of Stones, to ſuch a tender Creature as a Gnat, or an Ant. The unfortunate Inſect, blinded and overwhelmed in this Manner, by the Tempeſt that pours down from every Quarter, and hurried away by the Inſtability of the Sand that rolls from under her Feet, falls between the Saws of her Enemy, who plunges them into her Body, drags her under the Sand, and then feaſts upon the Victim. And when nothing is left, but the Carcaſs drained of all its Juices, he is particularly careful to remove it out of Sight. The Appearance of a dead Body would deprive him of future Viſits, and bring his Place of Reſidence under a bad Reputation: he therefore extends his Horns, and with a ſudden Spring, toſſes the Slain half a Foot beyond the Trench; and if this ſhould happen to be diſconcerted and filled up, by ſuch an Expedition, or if the Aperture becomes too large for the Depth, and the Declivity loſes its proper Slant, he repairs the whole with all Speed; he rounds, he deepens, he clears the Cavity, and then watches for a new Prey.

His Patience.

A Hunter's Profeſſion, they ſay, generally requires Patience, and the Lion-Piſmire has as large a Share of this Quality, as he has of Craft. He ſometimes paſſes whole Weeks and Months, without Motion, and, what is moſt ſurpriſing, without Food itſelf.

His Abſtinence, which is very ſerviceable to him, is ſo extraordinary, that I have known him live above ſix Months in a Box exactly cloſed up, and where he had no other Accommodation than Sand. I have ſeen them compleat their Work as uſual, and then change into Nymphs like others, whom I have carefully nouriſhed. 'Tis true, thoſe who eat, improve both in Growth and Vigour.

When he has attained a certain Age, and would undergo a State of Renovation, in order to appear in his laſt Form, he then troubles himſelf no more with his Trench, but begins to work in the Sand, where he ſtrikes out a Multitude of irregular Tracks, and certainly engages in this Labour, in order to warm himſelf into a Sweat; after which he plunges into the Sand, and the viſcous Humidity which flows from every Part of his Body, fixes and unites all the Grains he touches. With His Tomb. theſe ſandy Particles, and the dried Glew that conſolidates them, he forms a Cruſt which encompaſſes his whole Body, like a little Ball of five or ſix Twelfths of an Inch in Diameter, in which the Animal reſerves himſelf a competent Space for Motion. He is not ſatisfied with a bare Wall, which would inevitably chill him, but ſpins out of his own Bowels, a Thread, which, in fineneſs, infinitely ſurpaſſes that of the Silkworm, which we have ſo much admired. This Thread he faſtens, firſt to one Place, and then extends it to a ſecond, ſtill croſſing and interlacing it: By theſe means he hangs all his Apartment with a Sattin tinged with the Colour of Pearls, and perfectly beautiful and delicate. In this Work all the Propriety and Convenience is confined to the Inſide, for nothing appears without but a little Sand, which confounds and incorporates the Manſion with the contiguous Earth. And now he lyes ſecreted from the Purſuit of ill diſpoſed Birds; he reſts in Oblivion, and lives in perfect Tranquillity; whereas he would infallibly be loſt, were the Outſide of this Habitation ornamental enough to attract the View of any Creature, whoſe Curioſity might prove injurious to him.

In this manner he lives, ſecluded from the World, ſix Weeks or two Months, and ſometimes more, and then diveſts himſelf of his Eyes, his Horns, his Paws, and Skin. His Spoils ſink to the Bottom of the Ball, like a Heap of Rags; all that now remains is a Nymph, who has other Eyes, and Paws, other Entrails and Wings enfolded with a Skin, and hid in a nutrimental Liquor that gradually dries around her, in the ſame Manner as is cuſtomary with all Papilio's, when they diveſt themſelves of their vernicular Spoils, to aſſume the Form of Aurelia's. When the Limbs of the new Animal have acquired their neceſſary Tone and Activity, he tears away the Tapeſtry of his Apartment, and pierces through the Walls; for which Purpoſe he employs a couple of Teeth, like thoſe with which the Graſhopper is furniſhed. And now he makes his Efforts, enlarges the Opening, thruſts out half his Body, and at laſt entirely quits his ſolitary Seat. His long Form, that winds like the Volute of an Ionic Capital,

tal, and poſſeſſes only three Twelfths of an Inch in Space, begins to unfold and extend itſelf, and, in an Inſtant, ſtretches to the Length of an Inch and three or four Twelfths. His four Wings, that were contracted in little Folds, and whoſe Dimenſions, did not exceed two Twelfths of an Inch, in the Film that ſheathed them, begin to be expanded, and, in the Space of two Minutes, ſhoot into a greater Length than the whole Body. In a Word, the malignant Lion-Piſmire aſſumes the Form of a large and beautiful Dragon-Fly, who after ſhe has for ſome time continued immoveable and aſtoniſhed at the glorious Proſpect of Nature, flutters her Wings, and enjoys a Liberty with which ſhe was unacquainted in the Obſcurity of her former State; and as ſhe has caſt off the Spoils of her firſt Form, ſo ſhe is likewiſe diveſted of her cumberſome Weight, as well as her Barbarity and pernicious Inclinations. In fine, ſhe appears entirely a new Creature, is all Gaiety and Vigour, graced, at the ſame time, with a noble and majeſtick Air.

Along the Edges of ſtanding Waters, one may find other Animals, like this in Form, * but painted with Colours much more radiant and lively, and their Original is alſo very different. The Inſect that ariſes from the Lion-Piſmire, lays her Eggs in the Sand, that her Young may be ſupplied with Food when it forſakes the Egg. Sand is no Part of its Suſtenance, but then it facilitates its Manner of Life. The Creature immediately ſinks a commodious Trench, and in leſs than an Inſtant, becomes compleatly ſkilled in Hunting and Geometry. The other Dragon-Fly, that flutters along the Surface of Ponds, plunges the Extremity of her Body into the Water, and there depoſites her Eggs. The Animals that iſſue from them, inhabit the fluid Element for ſome time; after which they aſſume a new Figure, and live upon the Earth in the Form of Aurelia's; but I am not ſufficiently acquainted, either with the Manner of Life, or Tranſmigration of this laſt Animal, of which there are ſeveral Species.

Counteſs. I adviſe you to inform yourſelf of their Hiſtory, for it muſt certainly be very entertaining, if it prove as agreeable as that of the Lion-Piſmire;

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* M. Aubriet deſſinat. au Jardin Royal.

and you have my Thanks for chuſing ſuch a pleaſant Subject.

Chev. This Compliment belongs to the *Prior*, for I owe all my Materials to his Generoſity.

Counteſs. I thought to acquit myſelf in my Turn; but what I have to offer may prevent the *Chevalier*'s intended Walk; and therefore, I hope, you will give me Credit 'till To-morrow, and the Aſſembly, if you pleaſe, ſhall be held in my Apartment.

The End of the eighth DIALOGUE.

TESTACEOUS ANIMALS.

DIALOGUE IX.

The COUNT *and* COUNTESS,
The PRIOR, *and*
The CHEVALIER.

Counteſs. LET us walk in.

Count. To what Purpoſe, Madam, are all thoſe Glaſſes ſo agreeably diſpoſed?

Counteſs. They are a little Collation, I have prepared for your Entertainment.

Count. I perceive a Set of Sea-Muſcles laid on a little Bed of Sand in the Water. Are we then to have theſe inſtead of freſh Oyſters? The Regale is ſomething new.

Counteſs. It is much better than your Lordſhip imagines, and I am very ſure I ſhall have your Thanks for providing it. Do you ſee nothing particular in the Muſcles?

Prior. I obſerve one quite open, and faſtened with ſeveral Strings, to a little Clod. One would be apt to take it for a Tent in Miniature, with all its Apendages of Cords and Stakes.

Count. I ſee too others, that are likewiſe fix'd to the Veſſels with fewer Threads. This is ſomething extraordinary, and her Ladyſhip certainly deſigns to ſhew us a Set of Spinſters.

Counteſs. That is the very Affair, and the Thought occurred to me, when you entertain'd the *Chevalier* with the Work of Caterpillars, and Spiders; they were Land Spinſters, but there are others peculiar to the Sea: I had an accidental View of them, and was deſirous of procuring you the ſame Entertainment.

Chev. For once, Madam, you are out of your Province; this is neither your Garden, nor the Nurſery of your Doves and Poultry.

Counteſs. Very true; but then it belongs to my Kitchen. Six or ſeven Days ago, my Steward paid the *Ripier* * for ſome Fiſh he had caught. I ſtopped a few Moments, to obſerve a Heap of Muſcles that had been delivered to the Cook, and was ſurpriſed to ſee ſeveral little Packets of Thread; upon which the *Ripier*, with the uſual Politeneſs of thoſe People, gave me to underſtand, that the Muſcles could not poſſibly be without it, and that it ſerved them inſtead of a Cable, to keep them ſteddy in their Mooring. This Information, I fancied, might produce ſomething agreeable to you, and therefore I ordered him, when he came next, to bring me a couple of Stone Jars full of Sea Water, with a little Sand, and ſome live Muſcles upon it. He acquitted himſelf of his Commiſſion very well, and came ſooner than I expected. I diſtributed the Water, as well as the Sand and Spinſters, into different Glaſſes, in order to obſerve the Event; and you may now ſee three or four of theſe Creatures at work. They certainly ſpin the Threads you obſerve, and which were not viſible till Yeſterday. With theſe Threads they faſten themſelves, either to ſome Part of the Veſſel, or elſe to the Sand, by a natural Habit, and to prevent the Water from waſhing them away; but how they make this Thread, I can't poſſibly comprehend.

Count. Can you, my worthy *Prior*, diſtinguiſh any thing particular in the Work?

The Muſcle.

Prior. I obſerve, in the three firſt Glaſſes *, that the Muſcle thruſts out of her Shells a kind of Trunk, or Tongue, with which ſhe ſeems to be making Trials of the propereſt Places where to fix their Thread.

The Tongue of the Muſcle.

Count. I have heard, that all Shell-Fiſh, of the ſame Nature with the Muſcle, have a kind of Trunk, and have frequently ſeen it, even thoſe that have been boil'd. I

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* A Ripier is one who brings Fiſh from the Sea-Coaſts to the Inland Parts.

† Memoirs de l'Academ. des Scienc. Monſieur de Reaumur, 711.

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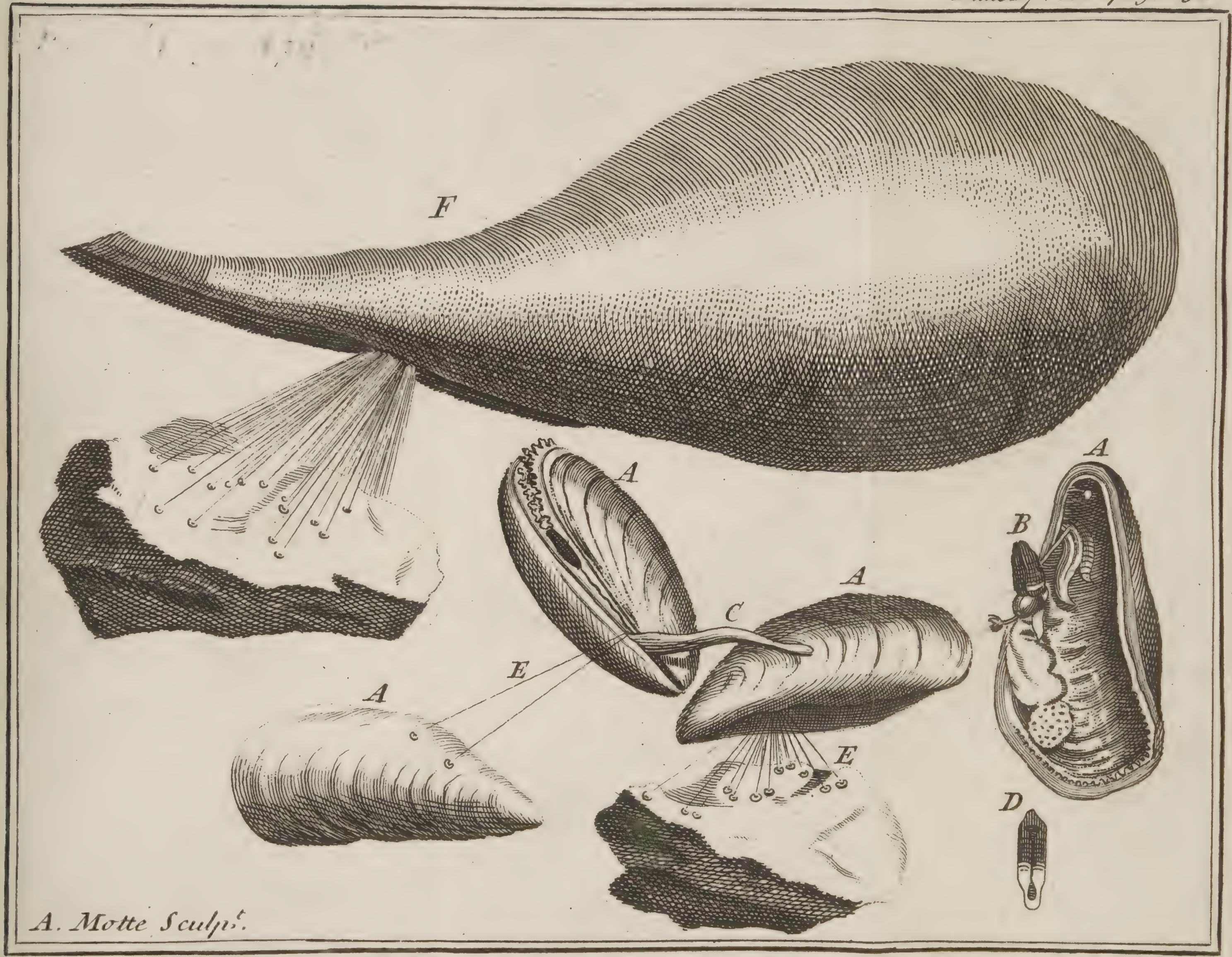
The Sea Muscle and Pinna Marina.

Plate 17 Vol. I page 138



A. Motte Sculp.ᵗ

A. A Muſcle. B. its Tongue. C. the Tongue extended in order to find ſome firm Situation. D. the ſame Tongue forming a kind of Channel. E. the Threads which the Muſcle forms with her Tongue and then faſtens to ſome ſolid Body. F. The Pinna Marina or large Muſcle fixed by his Threads.

know this Trunk performs the Office of a Foot, and enables theſe Creatures to move; they can likewiſe extend it, above an Inch and half, out of their Shells, and glew it to the Sand, but in what Manner, I am not able to declare; after which they immediately ſhorten it, and by theſe Means, move their little Habitation, and are capable of transferring it ſucceſſively from one Place to another. Their Motion. But I perceive this Trunk is ſerviceable to them in another Inſtance, and her Ladyſhip ſeems to have gueſſed it extremely well. It is not ſufficient, that the Animal finds Juices proper for its Nouriſhment, it muſt likewiſe be able to fix itſelf, in order to enjoy the Benefit of the Aliment; but, defenceleſs as it is, the firſt Blaſt of Wind, or the leaſt Agitation of the Waves, which are commonly in Motion, along the Coaſts where ſhe finds her Proviſion, would hurry her to a great Diſtance in an Inſtant; and therefore theſe Strings, in what Manner ſoever they are made, were given her to faſten and keep herſelf ſteddy. The Thread. Let us ſee if we can diſcover the Mechaniſm of her Work. Methinks I perceive it; Its Mechaniſm. let us have a little Patience; for, I hope by the Aſſiſtance of this Microſcope, to give you a good Account of the Matter. I ſee a kind of Channel or Furrow, run from one End of her Trunk to the other. The Muſcle has brought the Sides of it together, and formed it into a Tube, and a Drop of Liquor is juſt now ejected out of the Extremity, that touches the Place ſhe is fixed to.

Prior. That is very evident. The Drop has now aſſumed a round Form, and begins to thicken.

Count. I am apt to think, that the whole Trunk is as pliable as a thin Sheet of Lead, and rolls thro' its entire Length, into a round Form; whoſe internal Sides not being drawn ſo cloſe together as to conſtitute a Solidity, a little Chanel is left in the Middle, through which the Gum, that forms the Strings, is projected; and this Gum is ſhaped in the Cavity of the Trunk, like a Wax Taper in a Mould.

Prior. That muſt certainly be true, for you may now ſee all the Trunk unfold itſelf, and return to a Flat. The Liquor, which is condenſed in the Chanel, is diſengaged from the Mould, by bringing the Tongue to its primitive Form; and you may now ſee a new Cord made, one End of which is inſerted in the Stomach, from whence it proceeds, and the other terminates in the Subſtance to which it is faſtened.

Count. It is plain the Animal is not yet ſufficiently ſteddy, for I ſee the Trunk extended anew, and directed from Place to Place, in order to fix another Thread. Let us purſue her through all her Motions.

Chev. This is a Trunk that furniſhes the Muſcle with ſeveral Advantages: It is a Leg, to aſſiſt her in her Progreſs; a Tongue, to relish the Juices ſhe taſtes, and a Mould to ſhape the Thread for her faſtening.

Count. I begin to be perſuaded that her Threads are formed in the Manner we have repreſented, and can now comprehend how the great Sea Muſcle is able, with a finer Inſtrument, to form Threads more valuable than Silk itſelf, and with which the *Sicilians* make Stuffs of incomparable Beauty.

Chev. But here ariſes a Difficulty. When the Muſcle has eaten, or ſucked up all that is proper for her in one Place, how does ſhe diſengage herſelf? Theſe Threads muſt then be inconvenient to her.

Count. The *Chevalier* reaſons very juſtly; but I have not ſeen the whole Succeſſion of this Piece of Work, and conſequently have nothing poſitive to offer as a Solution of the Difficulty; but it is certain, that the Muſcles have a progreſſive Motion, and can transfer themſelves from Place to Place. From whence I conclude, that as they have a Magazine of viſcous Matter, with which they form their Threads, and faſten them, at one End, to a Stone, ſo Nature has alſo ſupplied them with a diſſolvent Fluid, which they pour, as they have Occaſion, on the Extremity of their Cords, or they have ſome other induſtrious Method of reſtoring themſelves to Liberty, in order to fix up their Tent in another Situation. They may poſſibly paſs their whole Life in one and the ſame Place, like Oyſters. I ſhould be glad to live at a leſs Diſtance from the Sea. It is another World we are but little acquainted with, and, by our Succeſs in the Experiment with which her Ladyſhip has entertained us, I am perſuaded one might make ſeveral curious Diſcoveries.

Counteſs. If we were to live near the Coaſts that produce the large Sea Muſcles, inſtead of the Manufacturers of groſs Thread, I would have ſhewn you a Set of Silk Spinſters; the Sight of their Work would have been an extraordinary Curioſity; but what Advantage may one derive from it?

Count. * I have ſeen Gloves of this Silk; they are made at *Palermo*, and 'tis not impoſſible to procure you ſome.

Prior. I have ſeen Gloves made of a very different Silk.

Counteſs. What Sort?

Prior. The Silk, or Thread of a Spider. The Gentlemen of the Academy at *Montpelier*, ſent them to be examined by the Academy of Sciences; and in a little Time after, with the ſame Materials, they wove Stockings and Mittans, that were preſented to the Dutcheſs of *Burgundy.*

Counteſs. Since this Thread is ſo common, why have they not erected it into a Manufacture?

Prior. This was one of the Attempts of Monſieur *Reaumur*, who is generally ſtriking into new Projects, that are very happy and important, even on the moſt common and neglected Subjects. This Gentleman endeavoured to collect a large Number of theſe Inſects, and cauſed them to be fed with Flies, and the Ends of young Feathers, newly plucked from Chickens and Pidgeons, becauſe ſuch Feathers are full of Blood, and eaſy to be procured, and they are likewiſe a delicious Regale for the Spiders. But he was ſoon convinced, that all his Care to nouriſh them with their moſt palatable Food, was ineffectual; for there is ſuch a Malignity in their Diſpoſitions, when a Number of them are together, that they ſacrifice all other Attentions to their natural Animoſities, and are perpetually endeavouring to devour one another. You ſee then, theſe are a People incapable of being eſtabliſhed into a Community; and tho' it were practicable to unite them in a Manufacture, it would require too much Room and Application to rear a competent Number. We may add to this, that their Thread is five Times finer than that of a Silk-Worm, and, by a juſt Computation, there muſt be ſixty Thouſand Spiders to produce one Pound of it; beſides, it is not certain that there is any Poſſibility of manufacturing their common Thread; for that which has hitherto been uſed, is what they wrap their Eggs in, and four Times as ſtrong as the Thread of their Web. In a Word, Madam, from the Reſult of all theſe Experiments, I doubt you muſt never expect to be well ſtocked with Gloves of this Manufacture.

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* Memoirs de l'Academ. des Scienc. 1710. p. 386.

Counteſs. I find then I muſt ſupply myſelf elſewhere.

Chev. I can eaſily comprehend how the Muſcle, with the Aſſiſtance of her Trunk, can move and ſtop as ſhe pleaſes; but I lately took a Snail from a Vine Leaf that hung at the Window, and ſaw him march without any Trunk, or Legs, to advance him in his Way. Pray how is this performed?

Counteſs. I am likewiſe in Pain, to know how the Snail, the Muſcle, and all Sorts of teſtaceous Animals, build the Houſe they always carry about them, and in what Manner they retire, when one touches them never ſo tenderly.

Prior. I have ſometimes examined the Structure of a Snail with much Attention, and can give you the Hiſtory of all that belongs to him, except the Formation of the Shell, which I reſerve for his Lordſhip.

The Snail.

Here we are no longer entertained with Plumes, nor Hair, nor Cones of Silk. This is a new Order of Being, wherein the Intentions are very different. Every Animal in Nature has an Habitation, and each Apartment its particular Beauties and Accommodations. The Roof under which the Snail reſides, comprehends two Advantages, which, one would imagine, were incapable of being united, I mean an extraordinary Solidity, and an uncommon Lightneſs. By means of which the Animal is protected from all Injury, and eaſily transfers her Houſe where ſhe pleaſes; and in what Country ſoever ſhe travels, is always at Home. At the Approach of the Cold, * ſhe retires into ſome Cavity, and her Body diſtils a certain Glew that condenſes at the Aperture of the Shell, and entirely cloſes it up. When ſhe is thus ſhrouded ſhe paſſes the diſagreeable Seaſon, like a Number of other

Her Retreat.

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* Memoirs de l'Academ. des Scienc. 1709.

Creatures,

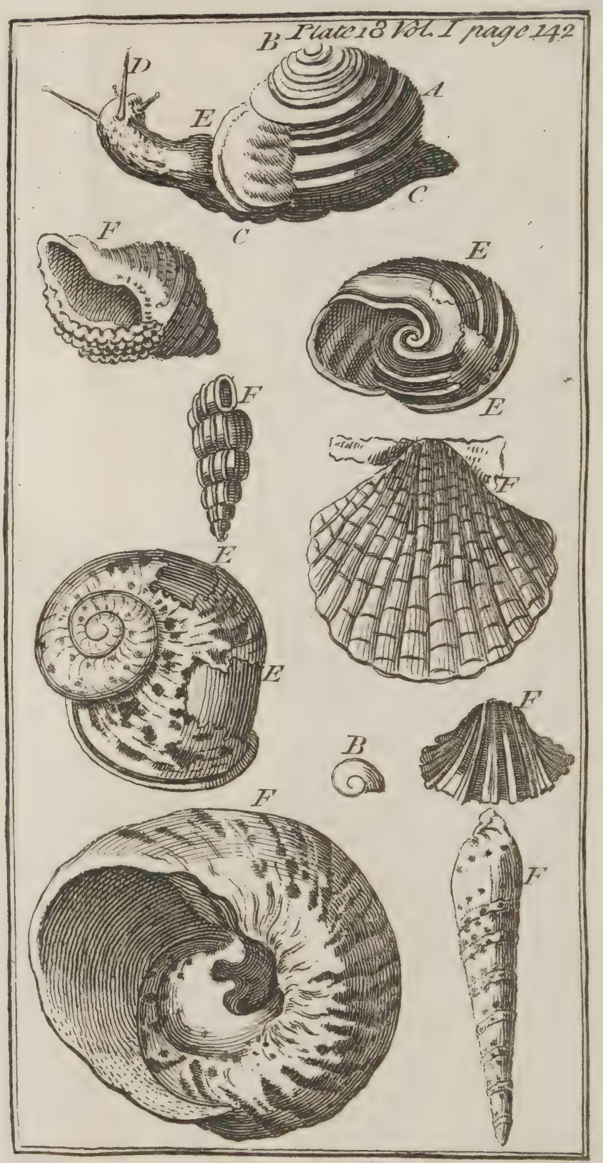

Plate 18 Vol. I page 142

A. Motte ſculp.

Snails

Creatures, free from all Pain and Want. When the Spring paints the Earth with a new Bloom of Flowers, the Snail opens her Door, and ſeeks her Fortune; at which Time all her Neceſſities revive with her Appetite; but in her creeping Progreſs, and charg'd as ſhe is with the Weight of her Apartment, if her Eyes were ſunk as low as the Body ſhe trails along the Ground, ſhe could not perceive the Objects ſhe ought either to avoid, or approach, and would at leaſt be perpetually liable to plunge and ſoil her Eyes in the Dirt; to prevent which Inconvenience, Nature has ſupplied her with four Teleſcopes, to aſſiſt her in the Diſcovery of all Objects that ſurround her.

Chev. Have you ever ſeen, Sir, the Tubes of theſe Teleſcopes?

Prior. I aſſure you, Sir, I am not in Jeſt; and only acquaint you with a ſimple Fact. You are not to imagine, that thoſe Projections which are commonly called the Snail's Horns, are really ſuch. They are four Tubes *, with a Glaſs fixed in the Extremity of each; or they may be called four optick Nerves, ending in as many beautiful Eyes; and the Animal not only raiſes its Head to take a diſtant View, but alſo extends theſe four Nerves, and the Eyes in which they terminate, much higher. She lengthens and directs them as ſhe pleaſes, ſo that they are real Teleſcopes, which ſhe turns, and contracts, as ſhe finds it neceſſary. The Eyes are very apparent in two of theſe Horns, and perhaps the other two are the Organs ſubſervient to the Senſe of Smelling.

Her Motion.

Thus you have ſeen her lodged and illuminated. She is qualified to diſcover whatever may be commodious to her; but as ſhe is deſtitute of Feet, how ſhall ſhe march to obtain what ſhe wants? This Defect is ſupplied † by two large muſcular Skins, that are lengthened by letting them out; after which, their Fore-part is ſhortened into Folds, and that in the Rear falls into the ſame Contraction; by which Means they draw the Manſion that reſts upon their Surface. But here another Difficulty ariſes: As ſhe is conſtantly glewed to the Earth, and has neither Wings to raiſe her into the

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* Liſter, Excercit. Anatom. Cochl.

† Derham, Theol. Phyſ. l. ix. c. 1. Liſter, ibid.

Air, nor Threads to ſuſtain her from falling, ſhe muſt be expoſed to the Danger either of tumbling from ſome Precipice, or being drowned in the firſt Water, wherein 'tis her Misfortune to plunge; and the very Humidity alone would penetrate and deſtroy her. But here Nature has interpoſed, and delivered her from all theſe Inconveniencies, by repleniſhing her with a viſcous Humour, that by its Coheſion, preſerves her from falling, and renders her impenetrable to all Moiſture, by the Miniſtration of an Oil, with which ſhe cloſes all the Pores of her Skin. She manages this precious Fluid with great Frugality; in order to which ſhe avoids the Sun that would evaporate it, and eaſily preſerve it in moiſt Places, where it proves extreamly beneficial to her.

Her Glew.

Nothing hinders her, at preſent, from ſearching out her Food; * and when ſhe has found it, ſhe cuts and divides it with two ſharp Teeth, with which ſhe ſometimes makes great Devaſtations on the fineſt Fruits, the tender Buds of Plants, and even the Leaves themſelves, on whoſe Preſervation that of the Fruit likewiſe depends. You ſee therefore, that Nature has not neglected this Animal, as contemptible as ſhe may appear to us, but has even furniſhed her with many peculiar Advantages.

Her Teeth.

The Generation of Snails.

But the moſt ſurpriſing Circumſtance that attends theſe Creatures is this; they are all Hermaphrodites §, and have the two Sexes united in them; ſo that each of them gives to the other that Fecundity which, at the ſame Time, is communicated to itſelf. When they are diſpoſed to approach each other †, they ſignify their mutual Inclinations in a Manner peculiar to themſelves; one launches againſt the other, a Kind of little Dart, which has four Wings, or minute Edges. This Weapon flies from the Animal, who ſhot it, and either lodges in the other, or falls down by him, after making a ſlight Wound; upon which

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* Godart Inſect. Tom. i. Liſter de Cochl. Hook Micograph. Obſ. 40.

§ Hiſtoire de l'Academie des Scienc. 1708. p. 48.

† Liſter de Cochl.

this Creature, in his Turn, diſpatches another Dart at the Aggreſſor; but this little Combat is immediately ſucceeded by a Reconciliation. The Subſtance of the Dart is like Horn; and the Animals are ſtocked with them at the Seaſons when theſe Approaches are made, and which happen each Year, thrice in every ſix Weeks, that is to ſay, once every fifteen Days: And each Inſect, eighteen Days after every one of theſe Periods, depoſites its Eggs in the Earth, and conceals them with extraordinary Care. My great Curioſity at preſent would be to know, if the Shell of the Snail is hatched in the Egg itſelf, and how it is augmented and repaired on every neceſſary Occaſion.

Count. I can afford you ſome Satisfaction, Sir, in theſe Particulars; for I have made five or ſix Experiments that have ſucceeded perfectly well, and enabled me to anſwer all your Queſtions.

The Shell.

When the Snail leaves the Egg, ſhe is array'd with the Shell compleatly form'd *, and of a Minuteneſs proportionable to that of her Body, and the Dimenſions of the Egg which incloſed it. This Shell proves the Baſis of a ſecond, which is perpetually increaſing; and the little Shell, ſuch as it is, at its Eruption from the Egg, will always be the Centre of the other, which the Animal, advanced in her Growth, forms and compleats, by adding new Circles to the firſt Shell: And as her Body can only be extended towards the Aperture, this muſt conſequently be the Part that receives the freſh Acceſſions, the Materials of which are lodged in the Body of the Animal, and formed by a Liquor, or viſcous Fluid compoſed of Glew, and ſeveral ſandy Particles of an exceeding Fineneſs. Theſe Ingredients are tranſmitted, through a great Number of little Channels, to the Pores, with which the whole Surface of the Body is perforated; but theſe being all cloſed by the Shell that covers them, the mixed Fluid is deflected to thoſe Parts of the Body that advance out of the Shell, and are entirely deſtitute of any Covering; and now the Particles of Sand and Glew, tranſpire without Impediment, and thicken into a

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* Malphigi Anatom. Plan. de Cochl. Memoirs de l'Academ. des Scienc. 1709. Monſieur de Reaumur. Leuwenhoek's Arcan. Nat. Tom. iii. Ep. 2.

Conſiſtence round the Extremity of the Shell. This viſcous Matter is drawn out into a thin Film, under which a ſecond is ſoon after extended, and this proves a Covering to a third. From the Union of theſe three Films, reſults an Incruſtration of the ſame Quality with the reſt of the Shell. When the Animal increaſes in Bulk, and the Extremity of her Body is not ſufficiently covered, ſhe continues to evacuate, and build in the ſame Manner: And by theſe Means, erects and repairs her Habitation. Some Time ago, I took ſeveral Snails, and broke off part of their Shells, without bruiſing the Animals. When this was done, I placed them under a Set of Glaſſes, and took care to accommodate them with a proper Quantity of Earth, and green Leaves; and then I immediately took Notice, that the ſame Part of the Body, which became viſible by the Fracture of the Shell, was covered with a Kind of Froth, or Sweat, that flowed through all the Pores; after which I ſaw this Froth gradually raiſed, by a ſecond Evacuation which flowed under it, and, in a little Time, lifted the Surface of the former, to a Level with the old Shell.

Prior. But is your Lordſhip ſure, that this forming Juice flows from the Body of the Animal, and not from the Extremities of the adjoining Shell?

Count. I have as much Certainty as the Fact will admit, and this is the Method I took for my Satisfaction. When I had made the Fracture in the Shell, I took the little Skin that grows under the Shell of a Hen's Egg, and carefully inſerted it between the Body of the Snail, and the Extremity of the Fracture; and if the Shell had then contributed to its own Reparation, the Juice that would have flowed from it, muſt certainly have been ſhed over the little Skin, and had covered it in proportion as the Cavity cloſed. As, on the contrary, if the Fluid proceeded from the Body of the Snail, this Skin would have prevented its Effuſion to the Shell; and, in this Caſe, the Juice would ſettle between the Cuticle, and the Body of the Animal, which, in Reality, happened to be the Fact.

Prior. I have no Objection againſt this Experiment.

Count. I had another Method of ſatisfying my Curioſity, which was this: I broke off all the laſt of thoſe four or five Contours, which compoſe the Shell of a Snail; after which,

which I drew, between the Shell and the Body, a ſlip of a Glove made of the fineſt Skin, the Extremity of which I afterwards folded over the Edge of the Shell, to which I faſtened it with Glew. Now, if the forming Fluid had diſtilled from the Shell, it would have forced away the little Skin, inſtead of which it was not once moved; but then the third Part of the Snail and more, which remained expoſed to the Air, was immediately covered with a Sweat that hardened into a Contour, which was joined to the old Shell in ſuch manner, that the little Skin of the Glove lay between them, thro' the whole Progreſs of the Contorſion.

Prior. I am very glad to ſee this Point cleared up, becauſe the ſame Facts that explicate the Formation of a Snail's Shell, illuſtrate alſo that of all ſorts of River and Sea Shell-fiſh. Let me beg your Permiſſion then, to propoſe another Difficulty, for I am perſuaded it will furniſh us with new Diſcoveries. If the Shells then are formed, as your Lordſhip has been deſcribing, and the Fractures they receive are repaired by a Matter that paſſes through the very ſame Perforations that originally ejected the Subſtance of the ſhattered Covering, the new Piece that fills the Vacancy ſhould exactly tally in Colour with the old Fragment, as well as with all the reſt of the Shell; and yet I have ſeen ſeveral Snails repair their Shell in ſuch a manner, that the additional Piece was of a different Colour from all the reſt.

The Spots in the Shells.

Count. Your Obſervation does not deſtroy any thing I have advanced, and you now give me an Opportunity of explaining the Original of thoſe Streaks and Clouds we obſerve, with Admiration, on the Shells of Snails, and the Generality of teſtaceous Animals.

Chev. I ſhould be glad to know their Cauſe; for I have frequently viewed ſome Shells, where the Streaks were drawn, without any Intermiſſion, from the little Point in the Middle, to the very Edges of the Aperture, and others, where theſe Streaks were diſcontinued, or intermingled with ſmall Stains, which had no ill Reſemblance to our Notes in Muſick. What can occaſion this Diverſity?

Count. It proceeds from the different Diſpoſition of the extreme Parts of the Animal's Body, that are viſible at the

Aperture of the Shell, where one may frequently diſcover ſome minute Lobes or Lines of Fleſh, that differ from the reſt in Colour. This Variety demonſtrates, that they have a different Texture from thoſe that are contiguous, and conſequently the Juices that flow into them, paſſing through Strainers, whoſe Perforations vary from thoſe of the adjoining Parts, acquire a particular Complexion in that Place; and as theſe Lobes perform their Functions and Evacuations as well as the others, and in the ſucceſſive Formation and Enlargement of the Shell, contribute their Proportion with the reſt of the fleſhy Subſtance that is from time to time, thruſt out all the Points of the Shell that correſpond with them, muſt inevitably aſſume the ſame Colour, and which differs from that of the contiguous Parts; conſequently theſe Colours muſt be drawn out, and diſtributed into Lines and Rays, and continued in the ſame Manner, as long as the Animal perſiſts in her gentle Motions, and makes new Additions to her Shell, by the repeated Protruſions of her Body.

But that you may the better comprehend this Work, it is neceſſary for you to know, that as the Animal increaſes in Growth, ſhe draws her Tail from the Bottom of the Shell, that now becomes too little for its Reception. She then aſcends higher, and fixes her Tail near the ſecond or third Contorſion of her Shell, and enlarges her Apartment at the Opening. As ſhe makes theſe Advances by little and little, and aſcends from Point to Point, as they lye contiguous to each other; thoſe Parts of her Body, in the Aperture of the Shell, that, by the Diverſity of their Pores, cauſe this Variation of Colours, form one continued and regular Streak; but when the Animal, in changing her Situation, leaves an Interval between the Point from whence ſhe removes her Tail, and the new one to which ſhe faſtens it, all the other Parts of her Body move in the ſame Proportion, and thoſe in the Orifice of the Shell, that impreſs the Stains, being transferred to ſome Diſtance from the preceding Speck, tinge the Shell ſo, as to leave a Space of more or leſs Extent between each Spot, and this is the Origin of the *Chevalier*'s muſical Notes. Different Cauſes may concur to paint and vein the Outſide with Colours, more or leſs lively in their Glow. The Quality of the Food, the Health or Indiſpoſition of the

Animal, the Inequality of her Conſtitution, according to the ſeveral Periods of her Age, and the Changes that may happen to the different Perforation of her Skin: In ſhort, a thouſand Accidents may intervene, to heighten or diminiſh certain Tints, and diverſify the whole to Infinity.

The Tumours and Inequalities of the Shell.

If the Shell, in the Variety of its Colours imitates the Diverſity of the Animal's Pores, it is ſtill more apparent, that it muſt aſſume the Form of the Body on which it is moulded. Thus we obſerve, in all Sea Shells, that if the Animal has any Swelling or Inequality on its Body, a Tumour likewiſe riſes in the correſponding Part of the Incruſtation. When the Creature diſplaces herſelf, and enlarges the Dimenſions of her Dwelling, the ſame Tumour, which had already raiſed the Shell in one Part, ſwells it anew at a little Diſtance, by which Means you ſee the ſame Species of Inequality, in a winding Line round the Shell. Sometimes theſe Protuberances of the Animal are ſo large, or ſo pointed, that thoſe which riſe over them, in the Shell, are like Horns. She afterwards fills the Inſide of theſe Cavities, and then, by new Evacutions of Sweat, ſtrikes out another Set of Horns, that protect her from Fiſhes, who are fond of Fleſh. If her Body happens to be channel'd, the Shell that covers it has the ſame Configuration: If the Fleſh riſes in Swellings, that wind round her in the Form of a Screw, the Shell has likewiſe its Elevations and Depreſſions, that are carried on in a ſpiral Line, from her Tail to the Extremity of her Body.

Prior. His Lordſhip's Exactneſs in this Account of the Formation of Shells, is confirmed by what we ourſelves frequently ſee. Nothing is more common than to find, in the Aperture of a Snail's Shell, and along the Rims of the two Shells of a Muſcle, a little Film, which is only the Sketch, or firſt Plan, of the Addition the Animal intends to make to her Habitation. Beſide this, when you throw the Shells of Muſcles, Snails, or Oyſters into the Fire, the Heat ſhivers them into thin Plates, or rather ſeparates the different *Strata* of Matter that compoſe the Shell, and makes them viſible by drying, or evaporating the Glew, and Salts, which cauſed theſe *Strata* to cohere.

Chev. Since we are upon Shells and Oyſters, I hope his

Lordſhip will be ſo good as to inform me from whence could proceed the two little Pearls, we found in one of the Oyſters that were brought to Table Yeſterday.

Count. My Thoughts upon the Matter, Sir, amounts to no more than this; the Oyſter was afflicted with the Gravel *.

Chev. Is your Lordſhip ſerious?

Count. Perfectly ſo.

Chev. How! are theſe Pearls, which we ſo much admire and purchaſe at ſo great an Expence, the Effect of a Diſtemper in the Animal who produces them?

Count. If the Fact be not certain, 'tis at leaſt extremely probable. The Juice or Glew with which Oyſters and large Sea-Muſcles form, by Tranſpiration, the firſt Structure, and future Enlargements of their Shell, is ſometimes extravaſated and forced out of its natural Repoſitory. It is then amaſſed in Drops, and hardened into little Balls or Globules, reſembling the Shell in Colour, and theſe are the very Pearls you enquire after.

Prior. It is certain, that the Pearl and Shell are exactly of the ſame Complexion, which makes it probable that they are both compoſed of the ſame Materials. In a Journey which I took twelve Years ago to the Southern Parts of *France*, I had an Opportunity of ſeeing the two Ports of *Marſeilles* and *Toulon*. In the laſt of theſe, they ſhewed me ſome large Sea Muſcles, whoſe Shell was above two Feet in Length. Upon opening them, we found ſeveral Pearls, ſome red, and others coloured like Mother of Pearl; but the red Pearls were in that Part of the Animal, where the Lobes of her Fleſh tinged her Shell with a red Dye; and the Pearls of the Colour of Mother of Pearl, were lodged in that Part, where the Shell was tinctured with the ſame Hue; which ſhews the perfect Conformity there is between the Juice which forms the Shell, and that which conſtitutes the Pearls. I may add too, that for one Pearl which is found in the Body of the Oyſter, there are a thouſand faſtened to the Mother of Pearl, where they form as many Warts.

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* Memoirs de l'Academ. des Scienc. 1717. Monſieur de Reaumur. Actes de Leipſ. 1586. Bonanni.

But

The Shell and Eyes of Crabs.

But let us take Notice of all that can be advanced againſt this Syſtem. Crabs diveſt themſelves of their Shell every Year, and eject a Liquor that glides over their whole Body, and which, by Degrees, growing dry and hard, changes to a Shell, as ſtrong as that they caſt off. At the Approach of this Moulting-time, if I may ſo call it, one finds in the Body of this Creature, certain Stones, which are improperly called its Eyes. Theſe Stones decreaſe in Size, in proportion as the new Shell conſolidates, and are not to be found in the Animal, after the Shell is compleated; which Obſervation made a celebrated Member of the Academy affirm, that theſe Stones were the Magazine or Stock of Matter, which the Crabs employed in the Renovation of their Shells. May not the Caſe be the ſame with the Oyſter and its Pearls, as it is with the Crab and its Eyes? And may not theſe Pearls be a Reſerve of Materials, appropriated to repair the Shells in the time of Need?

Count. Your Compariſon ſeems, at firſt, a little embaraſſing, but, upon a nearer View, it favours my Purpoſe. Whatever conſtitutes the eſſential Part of an Animal, is to be found in each Individual of the Species, and it is not probable that Nature ſhould, only in ſome Inſtances, afford that to them which they cannot by any Means ſubſiſt without. On the contrary, that which is a Default in an Animal, is only found in ſome of the Species; for no Default can be univerſal. The Stones in Crabs, that ſeem neceſſary Materials for the Reparation of their Shell, are to be found in the whole Species of theſe Creatures, at the Time when they change their Covering. But there are vaſt Quantities of Oyſters, in which Pearls are never diſcovered, from whence we may infer, that the Pearls are a Default in the Oyſter, and a Default too not very common. If the Pearls were the Stock of Materials with which the Oyſters renewed or repaired their Shells, every one of theſe Animals would have its particular Magazine.

Beſide, it has been obſerved by Travellers, that the Coaſts where the Pearl Fiſhery is tranſacted, are unhealthy; which makes it very credible that the Oyſters caught there, owe their Pearls to ſome Indiſpoſition that affects them. The *Spaniards* have abandoned this Fiſhery in *America*;

and it is certain, that the Air and Water of the Iſle of *Baharen**, from the Banks and Rocks of which the Divers bring up Oyſters, are inſupportable to thoſe who trade there for Pearls; nay, the very Peaſants have ſuch an ill Opinion of the Oyſters which produce them, that they never eat any. On the contrary, the more delicate our Oyſters are, the fewer Pearls are found in them; from whence it is natural to conclude, that the Waters which afford the greateſt Quantities of theſe pearly Fiſh, are unwholeſome; whereas the Oyſters that either live in a more ſalutary Fluid, or are nouriſhed with kindly Juices, produce few or no Pearls, becauſe their Temperament is free from all Sickneſs and Diſorder.

Gemelli.

Prior. I ſubmit, my Lord, for your Account appears to me very ſatisfactory.

Count. Though the *Chevalier* is not unacquainted with Teſtaceous Animals, yet if he will ſtep into my Cloſet, he ſhall ſee ſuch a Collection as will entertain him exceedingly, with the Richneſs and Variety of their Colours. He will ſee in that little Space, ſome of the Curioſities of the four Quarters of the World. Some Perſons diſtribute them into different Claſſes, and call each Shell by the Name of what it moſt reſembles. There is no extraordinary Merit in the Ability of giving each Claſs its Denomination; but it has its Uſe, becauſe you, by theſe Means avoid Confuſion, and can methodize this Part of Natural Hiſtory. One is infinitely affected at the Sight of this prodigious Variety of Species, that are conſtantly propagated with the compleateſt Similitude, through every Age: They are all formed upon the ſame Deſign, which is, to protect the Animal from Injury. But what a ſurprizing Variety flows from the Execution of this ſingle Deſign? They are all inveſted with Perfection, Graces and Advantages, accommodated to their Nature: Induſtry and inexhauſtible Sources are conſpicuous through every Tribe. Some curious Perſons, who are not ſo ſtudious of the Natural Hiſtory of thoſe Shells, as they are of the different

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* In the Perſian Gulph.

Effects they are capable of producing, by the Aſſemblage and Diſpoſition of their amiable Colours, make large Collections of them in all Shapes, and work them into artificial Rarities of a peculiar Taſte; ſuch as Sprigs of Flowers, Garlands, Grotto's, Landſkips, Architecture, and Figures of Men and Animals, the whole compoſed of large and little Shells. This ſort of Work requires much Patience, and ſometimes a great Share of Genius and Ingenuity. My Deſire, in ſhewing you my Collection, is to give you a better Idea of what I have told you, with Reſpect to the Manner of their Formation.

Chev. I ſhall be exceedingly pleaſed to repeat your Obſervations, and compare them with the Shells themſelves; but I forget to let you ſee three or four which I have carried in my Pocket a conſiderable Time; but they are very pretty in their Kind, and here they are.

Count. Theſe are all petrified.

Chev. Petrified! Pray what may your Lordſhip mean by that?

Count. My Meaning is, that the Shell, as well as the incloſed Oyſter, by lying in ſome Fluid of a petrifying Quality, have aſſumed the Nature of Stones without changing their own Figure.

Chev. I cannot comprehend what Oyſters your Lordſhip means; for Oyſters are taken in the Sea, but I found this on a Mountain. Some ſhort time before my Father went to *Amiens*, he covered his Parterres and Walks with Sand. Adjoining to his Eſtate are two Hills, where his Servants went to get two different Sorts of Sand, and each of a moſt agreeable Colour; the one Grey, and the other Yellow, tending to Red. Every time I went to ſee the Workmen, who were employed in digging the Sand, they gave me ſome of theſe Shells, which they often found in little Heaps, and they muſt certainly be of a different kind from thoſe found in the Sea.

Prior. Very well, Gentlemen, I find you are agreed in the ſame Deſign. Farewel Inſects, and Shells; you are going to examine the Hiſtory of the Earth, as it was before the Deluge. You ſee the Subject is pretty extenſive, and I muſt take my Leave.

Count. No, Sir, I beg the Favour of your Company for a Moment. We ſhall want your Aſſiſtance; and a ſhort Digreſſion on the *Chevalier*'s Queſtion, will be more inſtructive to him than Pearls of the brighteſt Hue. My dear *Chevalier*, I will ſhew you immediately, in my Collection, three Shells that are preciſely the ſame as yours, and both the one and the other have floated in the Waves of the Sea.

Chev. Who then has been at the Pains to carry them into the Heart of a Mountain?

Count. The Sea itſelf.

Chev. But I have heard, that the Sea never paſſes beyond certain Limits; and tho' by the Effect of ſome Tempeſt, or other Accident, it ſhould happen to overflow the neighbouring Plains, it can never extend itſelf to the Diſtance of twenty Leagues and more, for our Eſtate lyes as far as that from the Sea.

Count. How, *Chevalier!* Can't you gueſs when this Event happened? Would not the Difficulty you are under increaſe upon you, ſhould I tell you, that in the very middle of *Africa* * there are Plains full of Shells, above three hundred Leagues from the Sea, and that Heaps of them are piled up, on the Top of the *Alps* themſelves? You now find the Sea flowing over the Mountains. How ſhall we ſolve this Inundation?

Chev. On the contrary: I find the Difficulty begin to leſſen. The Maſs of Shells muſt certainly be convey'd to theſe Places by the Waters, when they deluged the whole Earth, and ſwelled fifteen Cubits above the higheſt Mountains. Give me my Shells again, if your Lordſhip pleaſes, for they are Curioſities older than the Flood.

Prior. It is certain, that all Nations have retained a Remembrance of the Deluge, and even the Poets have not loſt the View of it, amidſt the Obſcurity of their Fictions. The whole Earth is covered with indelible Monuments which atteſt the Progreſs of the Waters; and the univerſal Deluge is an Event, whoſe Proofs are ſtill preſented to our Obſervation, in what manner ſoever it was occaſioned, and as incomprehenſible as it may appear.

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* Hiſt. & Memoirs de l' Academ. des Scienc. preſque chaque année.

From whence reſults an important Truth; and let me intreat you, *Chevalier*, to fix it in your Memory; it is this, There are, both in Nature and the ſacred Writings, many Particulars above the Reach of Man's Conception; but the Reality of whoſe Exiſtence does not, for all this, ceaſe to be certain, and capable of Demonſtration.

The End of the FIRST PART.

Part the SECOND.

BIRDS.

DIALOGUE X.

The COUNT, *and* COUNTESS.
The PRIOR, *and*
The CHEVALIER.

Counteſs. YOU ſeem to be at a Loſs, Gentlemen, for a new Subject of Converſation. Let us proceed to Birds. Will you be always creeping on the Earth, with your Snails and Reptiles?

Prior. Let us take our Flight from terreſtrial Droſs, and grow acquainted with the Inhabitants of the Air. All the Univerſe you ſee, is repleniſhed with Life: Every Part of Nature abounds with Action, and its proper Animals: You cannot proceed one Step without diſcovering new Traces of a Wiſdom as inexhauſtible in the Variety of its Plans, as in the Richneſs and Fertility of the Execution. Caſt your Eyes on that Bird, who wings the Air; nothing is more natural to Eyes that have been habituated to ſuch a Sight, and nothing is ſo aſtoniſhing to the Optics of Reaſon. It is evident, that a Paſſage through the Air, which has been denied to other Animals, is open to theſe. The Fact is certain; and yet ſeems to be altogether impoſſible. A Bird in Flight, is a Maſs rais'd aloft in ſpite of the Weight of the Air, and the powerful Gravitation impreſs'd on all Bodies, and which impels them to the Earth. This Maſs is tranſported, not by any foreign Force, but by a Movement accommodated to the Purpoſe of the Bird, and which ſuſtains her a long Time with a graceful Vigour. This is another Subject of Admiration. I conſider all theſe Birds, I ſee each Individual furniſhed with no more than two Wings, and yet I obſerve them all flying in a different Manner: Some launch away in repeated Springs, and advance by ſucceſſive Boundings; others ſeem to glide through the Air, or cleave it with an equal, and uniform Progreſs. Theſe always ſkim over the Earth; thoſe are capable of ſoaring up to the Clouds. You will ſee ſome who know how to diverſify their Flight, to aſcend in a right, oblique, or circular Line, to ſuſpend themſelves and continue motionleſs in an Element lighter than themſelves; after this, to ſtart into an horizontal Motion, and then dart themſelves either to the Right, or Left, wheel into a contrary Track, remount, and then precipitate themſelves in an Inſtant, like a deſcending Stone; in a Word, they tranſport themſelves, without Oppoſition, or Hazard, where-ever their Neceſſities or Pleaſures invite them. When I am converſant with them in their Habitations, I ſtill find them equally ſurpriſing. I am enchanted with the Structure of their Neſts, the Solicitude with which they attend their Eggs, the Mechaniſm of the Egg itſelf, and the Birth and Education of their Young.

Counteſs. The *Prior*, in his Enthuſiaſm, has given us an agreeable Diſpoſition of the Particulars of our Entertainment. I charge myſelf with the Neſt, and domeſtic Employment of the Bird, for I would willingly have my Part, as well as the reſt. Do you know where I purſued my Studies? Truly with my Finches, my Pidgeons and Ducks; I know each particular by Heart.

Count. Indeed, Madam, they are the beſt Books; and the Portraits you copy from Nature, will always have the fineſt Likeneſs.

Chevalier. Her Ladyſhip has had an Opportunity of obſerving ſeveral particular Curioſities in that delightful

Bower which the *Count* has incloſed with a Lattice of Braſs Wier. I think I have ſeen in this charming Aviary all imaginable Sorts of little Birds, as well as thoſe of a middling Size.

Counteſs. Chevalier, this Aviary boaſts a little of my Invention, and I commonly undertake the Management of it, but my Pains are requited by Pleaſures that vary every Day. The Contentions of theſe little Creatures, their Endearments, their Melody, and Labours, and the obliging Civilities I receive from the Generality, when I pay them a Viſit, are extreamly entertaining to me. I carry my Work to them, and am never alone. One may paſs whole Hours and Afternoons there, without finding the Converſation languiſh, and it ſeems to me, to be that Part of the Houſe for which the *Chevalier* has the greateſt Fondneſs.

Chevalier. I am ſurpriſed we don't every where meet with ſuch an eaſy Amuſement. But what prevents us, Madam, from adjourning the Aſſembly to the Aviary? We can't talk of Birds in a more proper Situation; we ſhall have a full View of them all, when they come by Turns to play, and drink on the Edges of the little Canal that runs through the Bower.

Counteſs. I have lately ſeen a Couple of new Broods *, though the Seaſon be far advanced. The Affair is of ſome Importance, becauſe they are two Species, I am very deſirous of preſerving. Long Viſits, and abundance of Company diſcompoſe them, and make them frequently forſake their Eggs; but, without invading the Liberty of our Solitaries, I will acquaint you with the Structure of their Neſts, as well as if they were before your Eyes.

The Neſt.

I am never tired with obſerving the perfect Similitude that appears in all the Neſts of Birds of the ſame Species, the Difference between the Neſt of one Species, and that of another, and the Induſtry, Neatneſs, and Precautions, which reign thro' the whole. As my little Priſoners cannot make Excurſions for the neceſſary Materials to build their Neſts, I take care to ſupply them with every thing I imagine can be agreeable to them, and am curious to obſerve what compoſes thoſe Neſts the Children bring me from all Parts; accordingly I throw into the Aviary, Sprigs of dry Wood, Shivers of Bark, and dry Leaves, Hay, Straw, Moſs, Down, Wool, Silk, Spiders Webs, Feathers, and a hundred other little Materials that are all uſeful in the Neſt. You would ſmile to ſee the Inhabitants come to traffick at this Fair: One wants a Bit of Moſs; another has occaſion for a Feather; a third can't do without a Straw; you will ſee two out-bidding one another for a Lock of Wool, and this ſometimes cauſes great Quarrels; however, the Difference is commonly adjuſted, and each carries what ſhe can to the Neſt.

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* The Goldfinch, Greenfinch, and others, ſometimes build their Neſt in Auguſt and September. Theſe Exceptions, which are very rare, don't deſtroy the general Order remark'd elſewhere.

They are as well furniſhed with Proviſions too, and I have appointed a Steward, or Purveyor for them, who waits on them with Worms, Caterpillars, Flies, beſides ſeveral Sorts of Seeds, and who ſerves them all according to their Appetites in each Seaſon. One finds a great Advantage in bringing them up in this Manner, under a green Covering. They enjoy a better State of Health, act with more Freedom, and one has a better View of their various Characters and Labours.

One Species builds its Neſt on the Top of Trees. Another chuſes to ſettle on the Ground, under a Canopy of Graſs, but where-ever they diſpoſe themſelves, they are always accommodated with a Shelter, and either make choice of Herbs, or a ſhady Branch, or a double Roof of Leaves, down the Slope of which the Rain trickles, without entering into the little Opening of the Neſt, that lyes conceal'd below. The Neſt is raiſed on more ſolid Materials, that ſtrengthen it with a Foundation; for which Purpoſe they make Uſe of Thorns, Reeds, thick Hay, and compact Moſs. On this firſt Lay, that ſeems very ſhapeleſs; they ſpread, and fold in a Round, all the moſt delicate Materials, which being cloſely interwoven, prevent the Acceſs of Winds and Inſects. But each Species has a particular Taſte in the Building and Furniture of its Apartment, and when this is compleated, they never fail either to hang the Inſide with a Tapeſtry of Feathers, or quilt it with Wool, or Silk itſelf, in order to communicate a convenient Warmth around them, and their Young. When their Supplies fail them, there is ſcarce any Invention, to which they have not Recourſe for a Recruit; and this is what I learnt from the firſt Thiſtle-Finches I bred: I only furniſhed them with Hay for the Structure of their Neſt, and the Female, for want of Raw-Silk, or Cotton, found out an Expedient that ſurpriſed me. She began to unplume the Breaſt of the Male, without the leaſt Oppoſition from him, and afterwards hung all the Apartment very artificially with the Down.

Chevalier. This indeed is aſtoniſhing. Who acquainted this Mother that ſhe would have Eggs, and Young, and that theſe Eggs could not be cheriſhed without Heat?

Prior. Admire the Skill and Induſtry, as well as the provident Care of this Creature; or if you will not allow her to be Miſtreſs of theſe Qualities, acknowledge their amiable Diſplay in Him who furniſhed Man with the Gift of Reaſon, that extends to every thing round him; and who inſpired Animals with an Imitation of this Reaſon, limited indeed to a ſingle Point, but admirable in that very Limitation. For is it not an infinite Reaſon that directs the Labour of this Bird, when ſhe builds her Neſt? Who informed her ſhe ſhould lay Eggs, and would want a Neſt to preſerve them from falling, and cheriſh them with a genial Heat? that this Heat would not be concentered round the Eggs, were the Neſt too large, and that the Neſt would be incapable of containing all the Young, were ſhe to give it leſs Dimenſions? How comes ſhe to know its juſt Proportion and Extent, with the Number of Young to be born? Who has regulated her Almanack, that ſhe might not miſcalculate the Time, and lay her Eggs, before ſhe had compleated her Neſt?

Count. There is one Circumſtance that aſtoniſhes me yet more. The Workman who makes a Baſket, is furniſhed with Fingers and Implements. The Maſon has his Hod and Trowel, his Line and Square. But the Inhabitants of my Aviary, who accompliſh Works of every kind, have no Utenſil but their Bill.

Counteſs. Forgive me an odd Thought that comes into my Head. Let us ſuppoſe *Dædalus*, or any other Architect you pleaſe, to be transformed into a Bird, no longer accommodated with Arms, or Tools, or Materials, and Maſter of nothing but his Science and Beak. How will he employ them? The Bird indeed has a Beak, but no Science, and yet ſhe forms Works that diſcover all the Propriety of the Baſket-maker, and all the Induſtry of the Maſon; for in ſome of theſe Neſts, the Hairs and Reeds are interwoven with great Dexterity: * Others have all their Parts properly faſtened and connected with a Thread which the Birds ſpin from a Flew, as well as from Hemp and Hair, and generally from the Webs of Spiders, which ſhe eaſily procures when theſe wandering Creatures dart from Place to Place, and fill the Fields with their Threads, by the Aſſiſtance of which, they change their Situation, and go in queſt of Company. † There are other Birds, ſuch as the Blackbird and Lapwing, who after they have made their Neſt, rough-caſt the Inſide with a ſmall Lay of Mortar, that glews and ſupports all below; and by the Aid of a little Flew, or Moſs, with which they temper it when it is freſh and ſoft, form a compleat Wall within; let us rather call it an Apartment, commodiouſly furniſhed, and properly calculated to preſerve the neceſſary Warmth. I have frequently, from my Window, ſeen the Swallow either beginning, or repairing her Neſt, which is a Structure entirely different from all others: She wants neither Wood, nor Hay, nor Bands, but knows how to make a kind of Plaiſter, or rather Cement, with which ſhe erects a Dwelling equally ſecure and convenient for herſelf and all her Family. She has no Veſſels to receive the Water ſhe uſes, nor a Barrow to convey her Sand, nor a Shovel to mix her Mortar; but I have ſeen her paſs and repaſs over the Baſon in the Parterre; ſhe raiſes her Wings, and wets her Breaſt on the Surface of the Water, after which ſhe ſheds the Dew over the Duſt, and then tempers and works it up with her Bill. But I try your Patience, *Chevalier*, and am ſenſible I am a little extravagant in my Fondneſs for Birds.

The Neſt of a Titmouſe.

The Swallow's Neſt.

Chevalier. Let me intreat you, Madam, to continue your Account, for I am charmed with hearing you. Pray what ſucceeds when the Neſt is compleated?

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* Derham, Theol. Phyſ. l. viii. c. 4. rem. 5. Raii Synopſ. Avium, p. 74.

† Willughby's Ornithol. p. 140.

The Brood.

Counteſs. The Dam then lays her Eggs, the Number of which varies according to the Species: Some have only two at a Time; others four, or five, and ſome eighteen. When the Eggs are laid, the Male and Female brood over them by Turns; but this is generally the Female's Province. And here we muſt unavoidably admire the Impreſſions of a ſuperior Reaſon that acts upon theſe little Creatures: They have no certain Knowledge either of what their Eggs contain, or of the Neceſſity there is to ſit on them, in order to hatch them, and yet this Animal, who is ſo active and unſettled at other Times, in this Moment forgets her natural Diſpoſition, and fixes herſelf on the Eggs as long as is convenient; ſhe ſubmits to Reſtraint, renounces all Pleaſure, and continues almoſt twenty Days, inſeparable from her Brood; and that with a Tenderneſs ſo extraordinary, as makes her forget to eat. The Male, on his Part, ſhares and alleviates her fatigue, he brings Food to his faithful Mate, repeats his Journies without Intermiſſion, and waits on her with the Collation ready prepared in his Bill; his Services are accompanied with the politeſt Behaviour, and if he ever diſcontinues his Aſſiduity, 'tis to entertain her with his warbling: He acts with ſo much Fire and Alacrity, and puts on ſo many Graces in his Departures, and Returns to ſerve her, that one is at a loſs to know, whether the painful Perſeverance of the little Mother, or the officious Inquietude of her Spouſe, are moſt to be admired.

Perhaps the *Chevalier* will not be diſpleaſed at my acquainting him with the Cares they undergo in the Education of their Young, but it would not be improper, before this, to give him a Deſcription of what the Egg contains, as well as of the Manner in which the Young is there formed, and how it afterwards iſſues from its Confinement. An Egg is a very common Food; but, dreſſed in a particular Manner, may prove an agreeable Regale. Can you, learned Gentlemen, tell us what an Egg is?

Count. It would be eaſy for me to fatigue you with too much anatomical Exactneſs. Let us therefore content ourſelves with an unpoliſhed, but true Deſcription. * One may judge of the Eggs of the ſmalleſt Birds, by that of a Hen, where the Parts are more apparent. * We may eaſily diſtinguiſh the Yolk in the Heart of an Egg, as likewiſe the firſt white Subſtance that ſurrounds it; and a ſecond White, in which the Maſs in the Middle ſwims: Beſides theſe, we can ſee the Ligaments that ſuſtain the Yolk, towards the Centre of the Egg, and can likewiſe diſcover ſeveral Membranes; one of which enfolds the Yolk, another the firſt white, a third and fourth encompaſs the whole; and laſtly, we ſee the Shell formed for the Defence and Preſervation of all the reſt. What lyes within theſe Incloſures has the firſt Formation, the Shell has the laſt, and hardens from Day to Day; 'tis a Fluxion of Salts evacuated from the Humours of the Dam, and which the Heat fixes and conſolidates round the Egg, to form a Cruſt, that has a double Function; one qualifies the Mother for diſcharging the Egg without cruſhing it, the ſecond preſerves the Young from all Accidents, till it be formed, and in a Condition to forſake the Egg. † We may even ſay, that the Egg performs to young Birds, the Office of a Breaſt and Milk, with which the Offspring of other Animals are nouriſhed, becauſe the little Chick, who lyes in the Egg, is firſt ſuſtained with the White of the Egg, and afterwards with the Yolk, when the Animal has gathered a little Strength, and its Parts begin to be fixed. Under this Membrane which ſurrounds the Yolk, is found a little Cicatrice, or white Spot, which is only the Seed, where the Chick reſides in Miniature. It has all its Organs, at that Time, but they are wrapped up, and comprehended in a Point. If the ſmalleſt Portion of that vital Spirit, which is deſtined to animate the Maſs, be then infuſed into it, by a Proceſs of which I have no Idea; the Chick receives Life at the ſame Inſtant, and its whole Subſtance is then in Motion. We have no adequate Conception, indeed, of a vital Spirit; but this Expreſſion points out a Reality, which is ſufficient for our Purpoſe.

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* Malpighi de ovo incubato.

The Chick.

The Cicatrice.

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* Willughby's Ornithol. l. i. c. 3.

† Leuwenhoek, Ep. phyſ. 40. Willughby, ibid.

Prior. We have a Privilege to uſe this Term, without comprehending it; as we mention the Word Sun, without acquiring a competent Idea of that Luminary.

Count. When the vital Principle has not been infuſed into this Speck, which comprehends, not only the firſt Sketch, but every Part of the Chick, the Dam may ſometimes lay that Egg, but it will contain nothing more than an unprolific Nouriſhment, and will never be a living Animal. On the contrary, ſhould this enlivening Spirit be tranſmitted, in the minuteſt Degree, thro' the Pores of thoſe Membranes, thro' which ſuch a Diverſity of Aliments has already flowed, it will then open the ſmall Veſſels of the Chick, diffuſe a general Warmth, and convey a nutrimental Fluid to the Heart. The Structure of this little Muſcle enables it to open and dilate, for the Reception of what paſſes into it on one Side, and likewiſe to contract itſelf, for diſcharging thro' another Orifice, what has been already received. This Pulſation of the Heart has ſome Analogy to the Pendulum of a Clock, from whoſe Vibration, the whole Machine derives its Motions. The Moment the Heart begins to beat, the Animal is alive, but ſtill continues to receive, by the Mediation of the umbilic Duct, a Flow of nutritious Juices, which it tranſmits into the other Veſſels, whoſe Branches diſtribute this Nouriſhment thro' the whole Body. All thoſe little Canals, which were flat before, are now ſwelled and inlarged; the whole Subſtance imbibes a proper Aliment, and the Chick begins to grow.

It is almoſt impoſſible to diſtinguiſh, amidſt the Fluids that ſurround it, the Nature of its daily Progreſs and Changes, till the Period, when it iſſues from the Shell. But let us not omit one Precaution, equally evident and aſtoniſhing, and which is obſervable in the Situation of the Speck, out of which the Animal is formed. This minute and globular Particle of Matter, which is lodged on the Film that enfolds the Yolk, has always its Poſition near the Centre of the Egg, and towards the Body of the Dam, in order to be impregnated with a neceſſary Warmth. As the Wick of a Mariner's Lamp is conſtantly preſerved near the Surface, by the Mobility of the Slings of the Lamp, and the Weight of the Veſſel of Oil, which always tends downwards, notwithſtanding the Motion of the Ship;

ſome Contrivance of this Nature, prevents the Young from being overthrown, upon any Removal of the Egg.

The Ligaments.

The Yolk is ſuſtain'd by two Ligaments, viſible at the Aperture of the Egg, and which faſten it, on each Side to the common Membrane glewed to the Shell. Should a Line be drawn from one Ligament to the other, it would not exactly paſs through the Middle of the Yolk, but above the Center, and would cut the Yolk into two unequal Parts, ſo that the ſmaller Part of the Yolk, which contains the Seed, is of Neceſſity raiſed towards the Belly of the Bird who performs the Incubation; and the other Part being more groſs and weighty, always deſcends as near the Bottom as the Bands will permit; by which means, ſhould the Egg be diſplaced, the Young could not receive any Injury; and whatever may happen, it enjoys a Warmth that puts all about it in Action, and by Degrees compleats the Diſengagement of its Parts. As it is incapable of ſliding down, it nouriſhes itſelf in Eaſe, firſt with this liquid and delicate White, which is adapted to its Condition, and afterwards with the Yolk, which affords a more ſubſtantial Food. And when its Bill is hardened, and the Bird begins to be uneaſy at his Confinement, he endeavours to break the Shell, and does ſo in Effect. After which he iſſues out, fully repleniſhed with the Yolk, which nouriſhes him a little longer, 'till he has Strength enough to raiſe himſelf on his Feet, and can march about to look for Proviſions, or until the Parents come themſelves to ſupply him.

Prior. From his Lordſhip's Obſervation, that ſome of theſe Young, when they abandon the Shell, are fed by their Parents, and others ſeek their own Proviſions, I have happened on a Thought which I ſhall propoſe to the *Chevalier*. The Birds who nouriſh their Young, have commonly very few; on the contrary, thoſe whoſe Young feed themſelves, when they firſt ſee the Day, have ſometimes eighteen or twenty in a Brood, and ſometimes more: Of this laſt kind are Quails, Pheaſants, Partridges, and Hens. Why then has the Dam who ſuſtains her Young ſo ſmall a Number, and why has ſhe ſuch a numerous Off-ſpring, who only walks at the Head of them, and never ſupplies them with Food? Do you impute this Difference to the Sagacity of the Parent, or the Capriciouſneſs of Chance?

Chev. There is no Capriciouſneſs in this Fact, but rather an extraordinary Prudence, which could only be imparted by him, who has regulated all Things to the beſt Advantage. The Dam who charges herſelf with the Care of ſeeking Proviſions, has but an inconſiderable Brood; were it large, both the Parents would be Slaves, and the Young but indifferently accommodated. As to the Mother who marches in the Van of her Progeny, without nouriſhing them, ſhe can conduct twenty as well as four: This is a Demonſtration riſing before our Eyes.

Counteſs. 'Tis very true, *Chevalier,* but who has theſe Eyes? You make me open mine to a Truth I was not ſenſible of before. You tell us of one Set of Young, who are nouriſhed by their Parents, and of another who ſeek their own Food, but how do theſe latter get what they want? Have they any Market where they may be ſure of finding their Proviſions? And how are the Cries of the former, who cannot make Excurſions for Suſtenance, heard on the Spot? Has the Father of theſe little ones any Magazine in which he hourly finds a ſufficient Supply for his whole Family?

Chevalier. They are all nouriſhed by one common Father.

Prior. He opens the great Magazine of the Fields, where they are all accommodated according to their Neceſſities. There they find Caterpillars and Worms, for their Young. The Atmoſphere likewiſe ſupplies them to a very conſiderable Height, with innumerable Flies and Gnats, the Generality of which are imperceptible to our View. When the Denſity of the Air cauſes theſe little Inſects to deſcend, the Birds lower their Flight, and deſcend in Proportion. The Earth alſo furniſhes them with Beetles, Snails, and Seeds of all Kinds, which are their Food when they are advanced in Strength; even Frogs, Lizards, Serpents, and thoſe very Animals we apprehend to be moſt pernicious, are a delicious Regale for Storks, and a Variety of other Tribes. God opens his Hand, and every Animal lives.

Counteſs. Here is another Inſtance of his Bounty, which relates to us in particular. Thoſe Birds who are detrimental to us, and thoſe with whoſe Exiſtence we can eaſily diſpenſe, are the Species who multiply the leaſt. On the contrary, thoſe whoſe Fleſh is moſt ſalutary, and whoſe Eggs afford the beſt Nouriſhment, are fruitful to a Prodigy. The Hen alone is a Treaſure for Man, and daily makes him a Preſent extremely valuable. If ſhe ſometimes ceaſes to furniſh out her Maſter's Table, 'tis only that ſhe may the better recruit his Poultry; and for her Services, ſo frequently repeated ſhe demands nothing but the moſt inſignificant Remains of his Barn and Table. It would be Ingratitude not to be ſenſible of the Merit of ſuch a Domeſtic. But let us leave this Article, and return to the Birds.

The Rearing of the Young.

I ſuppoſe the Eggs hatch'd; and now the Young makes its Appearance: With what a new Weight of Cares are the Parents charged, 'till the Brood are capable of ſubſiſting without them! They are ſenſible, 'till that Period, what it is to have the Care of a Family. Proviſion muſt be prepared for eight inſtead of two. The Linnet and the Nightingale labour then like the reſt. Adieu to Muſic, 'tis no longer a Seaſon for Singing: Or, at leaſt, they indulge it with the leſs Frequency. They are preſſed by Neceſſity, and conſtantly in queſt of Proviſions, ſometimes one, ſometimes the other, and ſometimes both together. They are up before the Sun, they diſtribute the Food with great Equality, giving each its Portion in its Turn, and never feeding one Bird twice. This Tenderneſs of the Mothers for their Young operates to a Degree that even changes their natural Diſpoſition, and new Duties introduce new Inclinations. 'Tis not only incumbent on them to nouriſh; they muſt likewiſe watch, defend, and forecaſt; they muſt oppoſe the Enemy, and hazard their own Perſons in each Encounter. Follow a Hen when ſhe becomes the Parent of a Family, and you will ſee ſhe is no longer the ſame Creature. Tenderneſs changes her Humours, and corrects her Imperfection, ſhe was formerly ravenous and inſatiable, but at preſent, ſhe no longer reſembles herſelf. Does ſhe find a Grain of Corn, a Crumb of Bread, or even ſomething more conſiderable in quality, and capable of being divided; ſhe never touches it herſelf, but gives Intelligence to her Troop, by a Note of Invitation they all underſtand: They run to her with great Expedition, and the diſcovered Food is only for their Uſe, whilſt the Mother confines herſelf to the greateſt Moderation in her own Meals. This Mother, naturally timorous, and who before knew nothing but Flight, is a Heroine at the Head of a Troop of Chickens; ſhe is no longer acquainted with Danger, but ſprings to the very Eyes of the ſtouteſt Dog, and is inſpired with ſo much Courage by her new Dignity, that ſhe would venture to encounter a Lion.

I lately ſaw one of theſe Creatures in another Situation, no leſs entertaining. I gave Directions to have ſome Eggs of a Duck put under her, and they were hatched to my Wiſh. The Young, when they quitted the Shell, had not the Form of her ordinary Brood: but ſhe ſtill fancied herſelf their Parent, and, for that Reaſon, was extremely pleaſed with them, and tended them as her own, with the greateſt Fidelity. She gathered them under her Wings, cheriſhed them with Warmth, and led them up and down, with all the Authority and Privilege of a Mother. She had always been perfectly well reſpected and obeyed by the whole Brood; but unfortunately for her Honour, a Brook appeared in the Way, and all the little Ducks were immediately in the Water. She was in a wonderful Perplexity; ſhe followed them with her Eyes along the Bank, gave them Counſel, reproached them for their Raſhneſs, called loud for Aſſiſtance, and uttered her Complaints to all around her. She returned to the Stream, and renewed her Call to theſe imprudent Creatures. But the Ducklings, tranſported to find themſelves in their proper Element, from that Moment diſcharged her of all future Care; and as they had then acquired Strength, they returned to her no more.

Prior. Her Ladyſhip will permit me to interrupt her a Moment, and aſk the Chevalier in what School theſe Ducklings had learned that Water was their Element? They certainly had not this Information from the Hen.

Chev. I conceive it. This Propenſity to the Water is implanted in the very Nature of the Duck. 'Tis the Work of the Deity.

Prior. One cannot, in ſuch an Inſtance, miſtake the

Impreſſion of the Creator, which anticipates all Leſſons, and corrects Education itſelf.

Counteſs. I muſt give the *Chevalier* another Inſtance of a Mother's Anxiety, to which I have frequently been a Witneſs. When the Turky Hen appears at the Head of her Young, ſhe is ſometimes heard to ſend forth ſuch a mournful Cry, the Cauſe and Intention of which are unknown. The Brood immediately ſquat under Buſhes, Graſs, or whatever elſe preſents itſelf for their Purpoſe. They intirely diſappear; or if they have not a ſufficient Covering, they ſtretch themſelves on the Ground, and lye as if they were dead. They are ſeen to continue in this Poſture, without the leaſt Motion, a whole Quarter of an Hour, and ſometimes a much longer Time. In the mean while, the Mother directs her View upwards with an Air of Fear and Confuſion; ſhe redoubles her Sighs, and repeats the Cry that laid all the Young proſtrate. Thoſe who obſerve the Diſorder of this Parent, and her anxious Attention, look up into the Air to diſcover the Cauſe; and at laſt perceive a dark Point which they can hardly diſtinguiſh, floating under the Clouds. This is a Bird of Prey, whoſe Diſtance withdraws him from our View, but who cannot eſcape either the Vigilance or Penetration of our Miſtreſs of the Family. This occaſions her Fears, and alarms the whole Tribe. I have ſeen one of theſe Creatures continue in this Agitation, and her Young in a manner rivetted to the Ground, for the Space of four Hours ſucceſſively, whilſt the Bird whirled about, aſcended and darted down over their Heads. But if he at length diſappears, the Mother changes her Note, and utters another Cry that revives all her Brood; they run to her, they flutter their Wings, and tender her their Careſſes; they have a hundred Things to tell her, and undoubtedly relate all the Dangers to which they have been expoſed. They beſtow their Imprecations on the vile Bird.—— But the Subject grows too ſportive to engage your Attention any longer.

Prior. Every Circumſtance of your Ladyſhip's Account is altogether worthy of Obſervation. Who could make this Mother acquainted with an Enemy who never injured her; and as yet, had not committed any Act of Hoſtility

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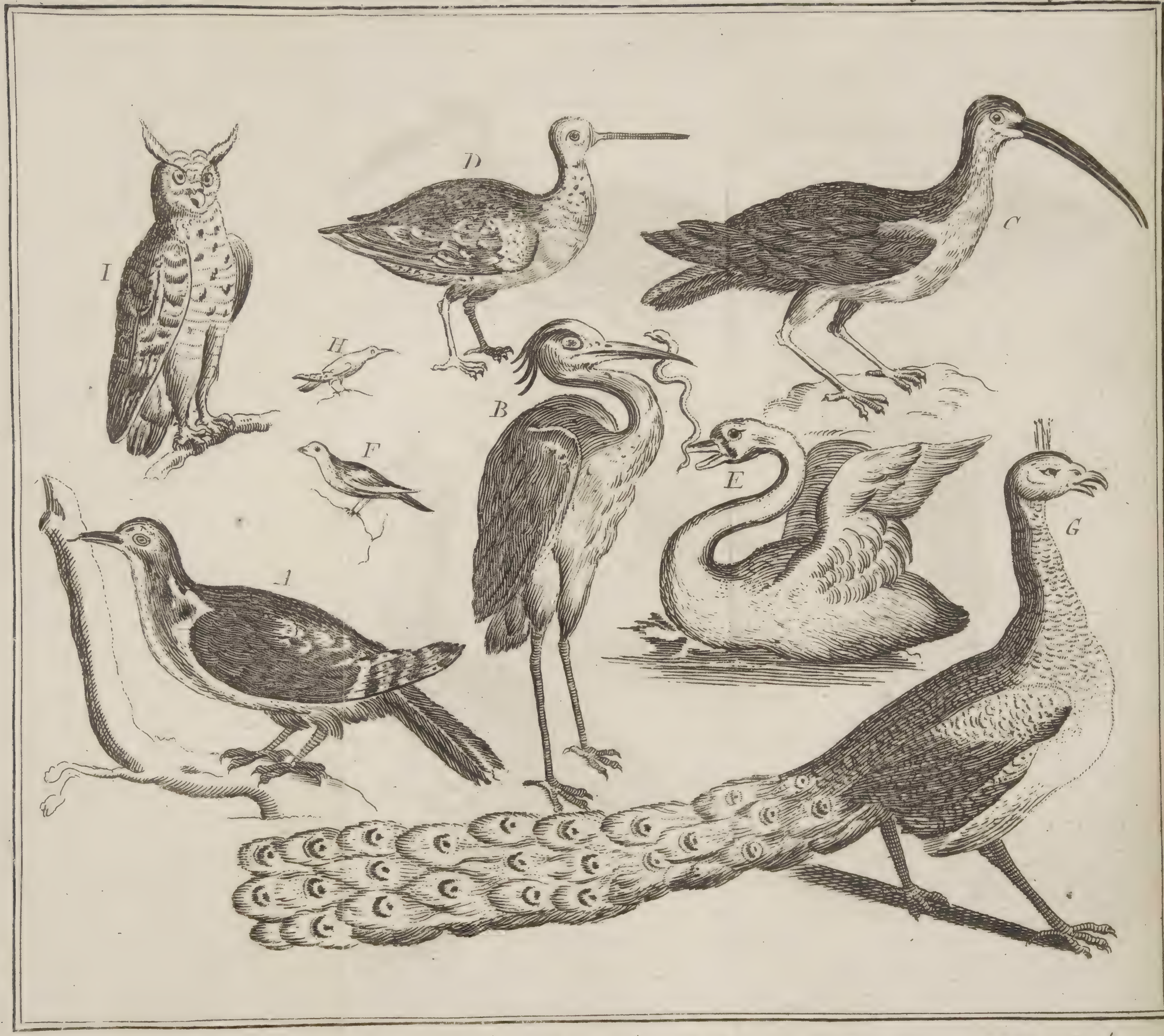

A. The Woodpecker darting his Tongue into the Cavity of a Branch B. The Heron C. The Curlew D. The Woodcock E. The Swan F. The Nightingale G. The Peacock H. The humming bird I. The Owl.

lity in the Country? And how could ſhe be able to diſcover this unknown at ſuch a Diſtance? What Inſtructions had ſhe given her Family, to diſtinguiſh, according to the Occaſion, the different Signification of her Cries; and to regulate their Behaviour by her Language? All theſe Wonders are daily obvious to our View, though we treat them with Inattention. In reality, the Picture her Ladyſhip has drawn, is much more engaging than ſome very ſerious Diſſertations.

Counteſs. The *Prior* however muſt give us one, on the Structure and Flight of Birds.

Prior. That I ſhall readily do. 'Tis a Subject perfectly agreeable to my Taſte.

The Form of a Bird.

The * Body of a Bird is neither extremely maſſive, nor equally ſubſtantial in all its Parts; but 'tis well diſpoſed for Flight, ſharp before, and gradually increaſing in Bulk, 'till it has acquired its juſt Dimenſions. Such a Structure renders it more adapted to cut the Air, and make itſelf a Paſſage through that Element.

The Crop.

The Gizzard.

To qualify it for long Flights, in which Proviſions are not always to be obtained; and to enable it to paſs away the many Hours of Winter Nights without eating, Nature has ſupplied it, under the Throat, with a Bag called the Crop, in which it reſerves its Meat. The † Fluid in which this ſwims facilitates its firſt Digeſtion. The Gizzard, into which no more than a very ſmall Quantity of the Nouriſhment enters at one Time, performs the reſt, and frequently by the Aid of ſuch little rugged Stones which the Bird ſwallows, in order to break the Texture of the Nutriment the better, and perhaps to keep the Paſſages clear.

The Bones.

The Bones of Birds, though of a Solidity ſufficient to ſuſtain the Syſtem of their Body, are nevertheleſs ſo hollow and diminutive, that they ſcarce make any Addition to the Weight of their Fleſh.

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* Derham Theol. Phyſ. l. vii.

† Willughby's Ornitholog. l. i.

The Feathers.

The whole Plumage is artfully formed and diſtributed, as well to ſuſtain the Bird as to defend it from the Injuries of the Air. The Quill of the Feather is, at the ſame Time, firm and light. It is firm, in order to cleave the Air with a proper Force: It is light and hollow, in Proportion to its Growth, that the Bird may not be whelmed downwards inſtead of being raiſed aloft. In a Word, this hollow Quill, or we may rather repreſent it as filled with a Body of Air more dilated and lighter than the external Parts of that Element, poſſeſſes a great deal of Surface with little Gravity, which places the Bird almoſt in Equilibrium with the Air. The Feathers are inverted behind, and laid one over another in a regular Order. That Part of them which is next the Body, is furniſhed with a warm and ſoft Down; and that next the Air is arrayed with a double Beard, in two Ranks, and longer at one End than at the other. Theſe Beards are a Row of little flat and thin Plates or Laminæ, diſpoſed and inſerted in a Line, as perfect as if their Extremities had been cut with a Pair of Sciſſars. Each of theſe Laminæ is itſelf a Quill or Baſis, which ſuſtains two new Ranks, of a Minuteneſs that almoſt renders them inviſible, and which exactly cloſes up all the little Intervals through which the Air might be inſinuated. The Feathers are likewiſe diſpoſed in ſuch a Manner that the Range of the little Beards of the one, ſlides, plays, and diſcovers itſelf, more or leſs, under the great Beards of the other Feather that lyes over it. A new Rank of leſſer Feathers ſerves as a Covering to the Quills of the larger. The Air is excluded from every Part; by which means the Impulſe of the Feathers on that Fluid becomes very ſtrong and efficacious.

But as this Oeconomy, ſo neceſſary in its Conſtitution, might be frequently incommoded by Rains, the Author of Nature has furniſhed Birds with an Expedient that renders their Feathers as impenetrable to the Water as they are by their Structure to the Air. * All Birds have a Bag filled with Oil, and ſhaped like a Nipple, the Situation of which is at the Extremity of their Body. This Nipple has

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* Willughby's Ornitholog. lib. i.

has ſeveral little Apertures, and when the Bird finds her Feathers dry, ſoiled, diſcontinued by Gaps, or ready to be moiſtened, ſhe preſſes this Nipple with her Bill, and forces out an Oil, or fat Humour reſerved in the Glands; and then drawing her Bill over the greateſt Part of her Feathers ſucceſſively, oils and dreſſes them, gives them a Luſtre, and fills up all the Vacancies with this viſcous Matter; after which, the Water only ſlides over the Bird, and finds all the Avenues to her Body perfectly cloſed. Our Poultry who live under a Covert have a leſs Quantity of this Liquor than Birds who inhabit the open Air; for which Reaſon, a Hen, when ſhe is wet, makes a ridiculous Figure: On the contrary, Swans, Geeſe, Ducks, Moorhens, and all Birds deſtined to live on the Water, have their Feathers dreſſed with Oil from their very Birth. Their Magazine contains a Proviſion of this Fluid, proportionable to the Neceſſity of its Conſumption, which is continually returning; their very Fleſh contracts the Flavour of it, and every one may obſerve that the Care of oiling their Feathers is their conſtant Employment.

The Wings.

If there is ſo much Wiſdom in the Structure of the Feathers, there is no leſs in the Play of the Wings and Tail, in order to traverſe the Air. Nothing can be better placed than the Wings; they form on each Side two Levers which keep the Body in a juſt Poiſe; at the ſame Time they perform the Function of Oars, which, by bearing on the Element that reſiſts them, advance the Body in a contrary Direction.

The Tail.

The Tail is a Counterpoiſe to the Head and Neck, and ſerves the Bird inſtead of a Rudder, whilſt he rows with his Wings; but this Rudder is not only inſtrumental in preſerving the Equilibrium of the Flight; it likewiſe enables the Bird to riſe, deſcend, and turn where he pleaſes; for as ſoon as the Tail is directed to one Point, the Head turns to the oppoſite Quarter.

Chevalier. Though I don't comprehend how Birds perform their Flight, I am of Opinion, it is not impracticable for Man to imitate them; and the Birds inſtruct him in the Method he ought to obſerve.

Prior. 'Tis certain that we have the Principle of Motion in our Legs and Arms; we likewiſe have, in the Feathers of Birds, and in our Linen Cloth and Oil, Materials of a ſeeming Fitneſs to form Wings, capable both of ſtriking and impelling the Air, without being penetrated by it. The Birds ſupply us with a Model of the Action, and at firſt View it ſeems to be an Invention naturally preſented to us, and which a ſmall Effort, or a few Reflexions, would ſuffice to make us acquire in Perfection; but I believe God, in conſequence of his providential Care of Mankind, has oppoſed an inſuperable Impediment in the Way; ſo that this Attempt, which has been frequently repeated, hath always proved unſucceſsful. The Art of Flying would be the greateſt Calamity that could happen to Society.

Chevalier. On the contrary, Sir, I ſhould think this Invention would ſave us Abundance of Labour. We ſhould be ſooner acquainted with what we are deſirous of knowing; and if we had once found out a ſmall Machine, could ſoon build a larger. We ſhould not only traverſe the Air ourſelves, but might likewiſe convey Cargoes of Merchandize through that Element. By this means Commerce ——

Prior. You have a charming Penetration, *Chevalier*, and are the beſt in the World at gueſſing the Advantages we might receive from this Invention; but theſe Advantages would not countervail the Diſorders that would be introduced.

Count. This is certain, that were Men capable of Flying, no Avenue could be inacceſſible to Vengeance and inordinate Deſires. The Habitations of Mankind would be ſo many Theatres of Murder and Robbery. What Precautions could we take againſt an Enemy, who would be capacitated to ſurpriſe us both by Day and Night? How ſhould we preſerve our Money, our Furniture and Fruits from the Avidity of a Set of Plunderers, furniſhed with good Arms to force open our Houſes, and as good Wings to carry off their Booty, and elude our Purſuit? This Sort of Trade would be the Refuge of every indigent and impious Perſon.

Prior. I may add to this, that the Art we are now mentioning would intirely change the Face of Nature; we ſhould be compelled to abandon our Cities and the Country, and to bury ourſelves in ſubterraneous Caves, or imitate Eagles and other Birds of Prey; we ſhould retire like them to inacceſſible Rocks, and craggy Mountains, from whence we ſhould, from time to time, ſally down upon the Fruits and Animals that accommodate our Neceſſities; and from the Plain we ſhould immediately ſoar up to our Dens and Charnel Rooms.

Counteſs. Ah! Gentlemen, you make me tremble at your Art of Flying; and I beſtow before-hand my Imprecations at the Perſon, who ſhall attempt to make it practicable. Let me hear no more of Dens and Charnel Rooms. Do you ſee, *Chevalier*, what you expoſe us to with your Inventions?

Count. Make yourſelf eaſy on this Head. We need not be under any Apprehenſions about the Art of Flying, which indeed is an abſolute Impoſſibility; Nature herſelf has formed an Obſtacle againſt it, that is in ſome Meaſure made invincible, by the exceeding Diſproportion between the Weight of the Air and an human Body. The hollow Machine that one muſt imagine capable of ſuſtaining the Body of a Man, and placing it in an equal Balance with the Air, would be ſo immoderately large and cumberſome, that learned Men have judged the Management and Uſe of it to be altogether impracticable, and as much forbidden to Man as the perpetual Motion.

Counteſs. Are you diſpoſed, Gentlemen, to reſume the Subject of Birds to-morrow.

Count. There is no Want of Variety. The Difficulty lyes in confining ourſelves to a due Limitation. What ſhall be the Articles of our Entertainment?

Prior. Let each chuſe what is moſt agreeable to his Taſte, and ſerve it up as a Country Collation.

Chevalier. If the *Prior* pleaſes to be my Security, I will acquit myſelf like the reſt.

Counteſs. For my Part, Gentlemen, I promiſe you before-hand a Bird found in no Place, but *America*; 'tis the leaſt and moſt beautiful of all Birds, and ſhould it not be ſufficient for you, I will make you amends with an Oſtrich.

The End of the tenth DIALOGUE.

DIALOGUE XI.

The COUNT *and* COUNTESS, *The* PRIOR, *and* *The* CHEVALIER.

Chevalier. YEſterday in the Evening I ſlipt into his Lordſhip's Cloſet, where I found *Willughby*'s Book lying open on the Table. I ran over all the different Species of Birds, who are there finely delineated and coloured after the Life, and my Thoughts turned on nothing elſe all the Night; but I was particularly ſurpriſed at the immoderate Bill and Legs I obſerved in ſome, whilſt others had a very ſhort Beak; and were ſo contracted in their Legs, that the Extremities of their Claws were hardly diſcernible. After all, both the one and the other are only ordained to expatiate in the Air, and ſeek their Food. For what Reaſon then is there ſuch a prodigious Variety in their Wings, their Bills, their Claws, and every other Part? Are all theſe different Forms no more than the Play of Nature; or do they tend to any particular Purpoſe?

Count. The Inequality you obſerve in the Bills of theſe Creatures, does not correſpond with the Differences you diſcover in the Noſes of Men; for in theſe, an Inch more or leſs conſtitutes all the Diverſity between the longeſt and ſhorteſt. In every other Particular the Structure and Uſe are the ſame; whereas, in the various Species of Animals, the Bill, the Talons, the Dimenſions of their Wings, and generally all the Parts of their Bodies are calculated for the Accommodation of their Wants. They are a ſet of Implements proportioned to the Nature of their Labours, and Manner of Life. A few Inſtances will be ſufficient to juſtify my Sentiments. Sparrows and the Generality of ſmall Birds, are ſupported by the little Grains they find either in our Houſes, or the Country. They have no Efforts to make, in order to obtain their Food, or break it in Pieces, and therefore have a ſmall Bill; their Neck and Legs are very ſhort, and ſuffice their Purpoſe. But the Caſe is different, with reſpect to the Woodcock, the Snipe, the Curlew, and a Variety of others; who ſeek their Aliment very deep in the Earth, and in Slime, from whence they draw the little Shell-fiſh, and Worms that ſuſtain them. Nature has ſupplied theſe Creatures with a very long Neck and Bill; and with theſe Inſtruments they dig, and ſearch, and want for nothing.

The Woodcock.

The Woodpecker, who lives in a very different Manner, is therefore as different in the Structure of his Body. His Bill is very long, and of an extraordinary Strength and Solidity; his Tongue is ſharp, extreamly long, and beſide that, it is armed with little Points, and always covered with Glew towards its Extremity. He has ſhort Legs, two Talons before, and as many behind, and all very crooked. All this Equipage relates to its Manner of living, and obtaining its Prey. This Bird derives its Subſiſtence from little Worms, or Inſects, who live in the Heart of certain Branches, and moſt commonly under the Bark of old Wood. 'Tis very uſual to find the Retreat of theſe minute Animals, ſunk very deep in large Billets, under the Bark, which eaſily peels off. The Woodpecker ſhould be provided with hooked Claws, in order to graſp the Branches where he faſtens. Long Legs would be uſeleſs to him, for his Attainment of what lyes under the Bark; but a ſtrong and pointed Bill was neceſſary for him, to find out by darting it up and down the Branches, what Places are void and rotten. He ſtops where the Branch ſounds hollow,

The Woodpecker.

low, and with his Bill ſhatters the Bark and Wood; after which, he injects his Bill into the Orifice he has made, and ſends forth a loud Cry, or a kind of whiſtling Sound, into the Cavity of the Tree, in order to alarm the Inſects who ſleep there, and put them in Motion. He then darts his Tongue into the Aperture, and by the Aſſiſtance of the ſmall Points, which riſe out of that Tongue, and the Glew which rolls over it, he draws out all the little Animals he finds there, and regales himſelf with the Prey.

The Heron.

The Heron quite contrary to the Woodpecker, is mounted aloft, his Legs and Thighs are very long, and entirely deſtitute of Plumage; he has a great Length of Neck, and an enormous Bill, very ſharp, and jagged at the Extremity. What Reaſons can be aſſigned for a Figure, which at firſt ſeems ſo extravagant? The Heron feeds on Frogs, little Shell-fiſh, as well as the other Fiſh he finds in Fens, or near the Shores of Rivers and the Sea. He wants no Feathers on his Thighs, to enable him to march through the Water and Slime; but very tall Legs are exceeding uſeful to him, as they qualify him for running, more or leſs in the Water, along the Shores, where the Fiſh uſually reſort for their Food. A long Neck and Bill make him capable of purſuing and ſeizing his Prey at a conſiderable Diſtance; the crooked Turn and Jags of his Bill, that bend like Hooks, enable him to detain the Fiſh, who would otherwiſe ſlide away, and eſcape him. In a Word, his large Wings, that may ſeem incommodious to an Animal of ſo ſmall a Body as a Heron, are infinitely aſſiſtant to him in making great Movements in the Air, and conveying weighty Burdens to his Neſt, which is ſometimes ſeated one or two Leagues from the Place where he fiſhes. A Friend of mine, who has an Eſtate in *Abbeville*, bounded by a little River plentifully ſtored with Eels, ſaw a Heron one Day carry off one of the largeſt of thoſe Creatures, into his Hernery, in ſpite of all the Efforts and Undulations of the Eel to oppoſe his Flight. What we have obſerved of the Heron, is applicable to ſeveral other Species which reſemble him.

Ounteſs. This is the firſt Time I have heard any Obſervations made on the Uſe of theſe Bills, which till now ſeemed a little extravagant to me. But I am ſenſible the

Imperfection belongs to myſelf, and all our Cenſures of Nature are really ſo many Confeſſions of our own Ignorance. I don't know, for Inſtance, wherein the prodigious Bill of a Stork can be ſerviceable; but ſhall never prevail on myſelf to cavil at it.

The Stork. She digs into the Earth with it, for Serpents and Adders, which ſhe afterwards conveys to her Young, to whom the Poiſon of theſe Animals is perfectly inoffenſive.

The Swan. Geeſe and Ducks. *Counteſs.* Its juſt Proportion is now very evident, and in Reaſoning on this Subject, methinks I ſhall be able to gueſs, why the Swans we ſee on the Canal below, have a long Neck, and a broad Bill. Swans, Geeſe, and Ducks are perpetually raking at the Bottom of the Water, becauſe they there find ſome of the little Vermin, or Worms you ſpoke of the other Day. As they are always ſwimming without being able to ſink, they ought to have a long Neck capable of extending to the Bottom; and therefore ſhould they not, quite contrary to other Birds, have a very broad Bill, to take in at one Time a larger Quantity of Slime and Gravel, and ſeize all the Worms found there, by ſeparating them from the other Matter, in which they are found? I even ſuſpect, that the upper Part of their Bill is pierced, in order to diſcharge the Water through that Opening, and that they may only ſwallow the Fiſh, or Inſect they have taken. Inſtead of thoſe crooked Talons, with which Birds who feed on Fleſh, are able to ſeize and turn their Prey, and faſten on the Branches where they ſettle; Swans, Geeſe, and Ducks have flat Feet, or large Paws, accommodated with Films, or Skins, which they extend in the Form of Fins, and with which they impel the Water one Way, that they may advance another. The *Prior* ſees I am mighty ſagacious. All this is very difficult to be explained.

Prior. The Merit of Natural Philoſophers, Madam, among whom we rank your Ladyſhip at preſent, does not always conſiſt in ſolving Difficulties; but rather in turning their Eyes on Points unobſerved by others, and commonly treated with Contempt. Nothing is more unuſual than to meet with People who think and reflect.

Counteſs. We Women are diſcharged from that Care, and it ſeems the Men do not uſually expect Thought from us. Among them, a little ſhining Livelineſs ſupplies us with every neceſſary Accompliſhment.

Prior. I muſt confeſs their Indulgence is very great in this Particular, and your Ladyſhip has no Occaſion to complain of them.

Counteſs. On the contrary, permit me to tell you, we have infinite Reaſon to complain of ſuch a Proceeding, and receive irreparable Injury from the Miſapplication of this Indulgence; 'tis this which renders us vain, indolent, incapable of Elevation, ignorant, unpenetrating, and irreſolute; and we may be certain, that the Men, by the Conduct they obſerve with reſpect to us, labour to form in our Minds all thoſe Imperfections for which they reproach us. Is it not one of the Maxims of their Politeneſs, to entertain us with nothing but Trifles? In the Language we receive from them, and the Aſſiduities with which they treat us, it is evident, they regard us either as Children, or Idols. Their Converſation with us, is always confined to Modes, or Play, and a certain polite Jargon. 'Tis a kind of Miracle, when any one of our Sex preſerves her Underſtanding from the common Wreck, and diſcovers a little Juſtneſs and Solidity. We ſuſtain no great Loſs, by not being inſtructed in the ancient Languages, and I have a perfect Indifference for thoſe learned Reſearches, and gloomy Sciences, which by an immoderate Application to them, make us uſeleſs to Society: But our Fate is to be lamented, in that the Generality of us have no ſolid Knowledge of our Religion; no Acquaintance with the Hiſtory of Mankind, which is alſo the Hiſtory of the Heart of Man; and ſcarce any Idea of the Works of the Deity. For my Part, I aſſure you, the People I have met with ſeem'd in a Combination to ruin the little good Senſe that might be diſcoverable in me. The *Count* was the firſt who did me the Juſtice to believe I had my Share of Reaſon as well as the reſt. It was evident by the Converſation with which he entertained me, that he judged me capable of Thinking; and is it not doing me Honour to believe me not unworthy to hear Diſcourſes on Things that every where preſent themſelves to our View, or are moſt eſſential to Life; to know why a Tree riſes in ſuch a Shape; to be acquainted with the Cultivations of the Earth, and the Qualities of a Plant that ſprings at our Feet, when we are walking? Since his Lordſhip has led me into a Habit of thinking, and employing myſelf to Advantage, my Country Seat has ſeemed to me an earthly Paradiſe. I enjoy Beauties and Treaſures with which Nature abounds, but which were ſo many loſt Treaſures to me, when I was not ſo much as acquainted with their Names.

Count. Your Complaints againſt our Sex are, without doubt, very juſtly founded. But I cannot ſay the ſame with reſpect to your Confeſſion of the diſagreeable Qualities of the Ladies. There are certainly great Numbers of them, in whom good Senſe is the prevailing Accompliſhment; and whoſe Underſtanding is equally judicious and delicate; whether they owe this Solidity to a happy Cultivation, or whether the Fineneſs of their Genius rectifies the Defects of a weak Education. But whilſt you are lamenting the Ladies Fate, and I am offering an Apology for them, we take no Notice that the poor *Chevalier* is half aſleep.

Counteſs. He is not to be blamed. I have promiſed him a Couple of foreign Birds, and inſtead of them give him a Lecture in Morality. What I am now going, Sir, to acquaint you with, I had from a Merchant at *St. Malo*, a great Traveller, and one who had contracted with my Lord, to furniſh his Cabinet with foreign Curioſities. Six Months ago he paid us a Viſit, at his Return from a new Voyage he had made to *America*, and the Coaſts of *Guiney*. He preſented me with two Humming Birds, and as many Eggs of an Oſtrich, and informed us of ſeveral entertaining Particulars, relating to theſe Creatures.

The Humming Bird.

The * Humming Bird is peculiar to *America*, and may paſs for a little Miracle of Nature, as well for its Beauty, as its Manner of living, and exceeding Smallneſs. It is not bigger than a large Fly, but is decked with ſuch a beautiful Plumage, that its Neck and Wings have all the lucid Colours of the Rainbow. His Neck is tinged with ſuch a glowing Red, that one might imagine it to be a Ruby. The Belly, and nether Part of the Wings, are as yellow as Gold; and the Thighs appear green as an Emerald: The Feet and Bill are black, and poliſhed like Ebony. The Eyes diſplay two oval Diamonds, and reſemble the Colour of poliſhed Steel. The Head is green, intermixed with Gold of a ſurpriſing Luſtre. A little Tuft riſes on the Heads of the Males, and is an Aſſemblage of all the Colours that ſhine in the other Parts of the Body. Theſe Birds fly ſo ſwiftly, that they are rather heard than ſeen. We are told, that Dews and the Juices of Flowers are their Food, which they extract with their little Tongue, whoſe Length exceeds that of their Bill, and ſerves them inſtead of a Trunk, which they contract and ſheath in their Bill. This Bill, which is not larger than a fine Needle, makes them formidable to the great Birds called *Groſbecs,* who endeavour to ſurpriſe the Young of the Humming Bird in their Neſt; but when the Dam makes her Appearance, the Invader flies off, and cries with all his Might, becauſe he is ſenſible what an Enemy he has to contend with. The Humming Bird purſues him cloſe, and if he can come up with him, faſtens himſelf with his little Talons, under the Wing of his Enemy, and pierces him with his pointed Beak, till he has made him incapable of Combat. You may ſee in that Box two of theſe pretty Birds, who, though they have been ſufficiently dried, ſtill retain a conſiderable Part of their rich Colours. You ſee they are hung, by their little Feet, to a ſmall Ring of Gold in the Form of Pendants, becauſe the Ladies of *Mexico,* apply them to that Uſe; and it muſt be confeſſed, no Pearls can equal them in Beauty.

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* Biblioth. univ. & hiſt. Anno 1687. Obſerv. cur. Tom. II.

Chevalier. Theſe are Birds in Miniature indeed. Your Butterflies can't ſhew more amiable Colours. But, Madam, I ſhall be glad to know if this charming Scent be natural to them.

Counteſs. Several People believe it proceeds from the Juices of the Flowers that nouriſh them; but my Merchant is of Opinion, that a little Ambergreaſe, or fragrant Gum is wrapp'd in the Cotton, with which they are filled, for their better Preſervation.

Count. The beſt expedient to ſecure them from being injured by Mites, and other Inſects, is to lodge them in Caſkets compoſed of ſeveral Glaſs Plates, whoſe Extremities are neatly joined with Bandages of Parchment, that have either been drenched in a bitter Gum, or are filled with Glaſs reduced to Powder.

Chevalier. This indeed will prevent them from being penetrated by the Teeth, and Piercers of Inſects: But her Ladyſhip, if I am not miſtaken, has promiſed us the Hiſtory of the Oſtrich.

Counteſs. This is one of the largeſt Birds * in the World, and they are more numerous in *Africa*, than in any other Country: Her Head riſes to the Heighth of a Man on Horſeback, and is ſometimes more lofty: Her Head and Bill reſemble thoſe of a Duck: Her Neck is like a Swan's, but greatly exceeds it in Length: Her Body bears ſome Similitude to the Camel's, having, like that Creature, a long Neck, and a riſing Back. The two Wings of the Oſtrich are very ſtrong, but too ſhort to raiſe her from the Ground, and † only ſerve her inſtead of Sails, or Oars, to enable her to cut through, and impel the Air, and add an extraordinary Swiftneſs to her Motion, when ſhe runs. She has the Legs and Thighs of an Heron, Allowance being made for the different Proportion: Each Foot reſts on three Claws, armed with Horn, to facilitate her march.

Her Eggs are as big as an Infant's Head: The Shell has Veins drawn over its Surface, like Marble, is very ſhining, and perfectly well poliſhed. I will ſhew you a Couple that were preſented to me. 'Tis the Cuſtom of the Oſtrich to hide them inconſiderately in the Sand; and, ‡ to leave, as we are told, the Care of hatching them to the Sun. This Diſpoſition, that ſeems to manifeſt ſo much Diſregard to her Young, has acquir'd her no extraordinary Reputation. In all Countries where ſhe is known, when they would ſpeak of a Mother who has little Tenderneſs for her Children, they compare her to the Oſtrich.

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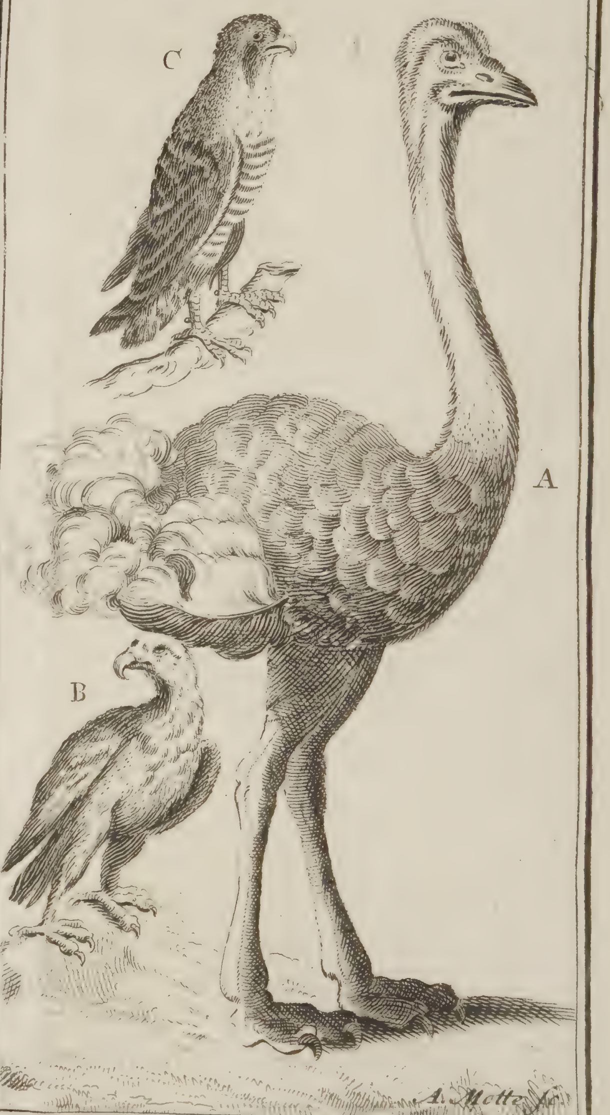
* Willughby's Ornithol. lib. xii.

† Diod. Sicul. lib. iii.

‡ Job xxxix. 14, 16, Lamentations of Jerem. c. iv. ver. 3.



A The Oſtrich. B. The Eagle. C. The Hawk.

Some * Travellers, as my Merchant inform'd me, have endeavoured to excuſe her and affirm, ſhe is careful to leave a Quantity of Worms near her Eggs, that her Young may find proper Nouriſhment when they iſſue from the Shell. Some have pretended to diſcover an admirable Diſcernment in the Oſtrich, which † inclines her carefully to warm thoſe Eggs, which are to be prolific, and to neglect the reſt, that they may ſerve for Nouriſhment to her Young, when they come to be hatched. But this has a conſiderable Caſt of the Fable; and it muſt be acknowledged, that the Prudence of other Animals is not viſible in the Oſtrich. She leaves her Eggs in the Sand, liable to be cruſhed by the Feet of Paſſengers, which is no extraordinary Inſtance of Precaution: But another Circumſtance, which has given Birth to the Remark, that her Conduct is not regulated by the Brain, is this: When ſhe is purſued by the Hunters, ſhe runs to hide her Head, and particularly her Eyes, behind a Tree; all the reſt of her large Body is expoſed to View, but as ſhe no longer ſees the Hunter, ſhe imagines that ſufficient, and believes ſhe has nothing to apprehend.

Chevalier. Is it true, my Lord, that Oſtriches eat and digeſt Iron, as I have heard?

Count. It is certain, they ſwallow ſmall Pieces of that Metal, as other Birds take down Pebble Stones, but they are not digeſted by theſe Animals; and if they ſwallow them, 'tis not to derive any Nouriſhment from them, but only to bruiſe and grind the Food in their Stomach, to moderate the Operation of an exceſſive Heat, and by its Weight open the Paſſages into the Inteſtines.

Counteſs. Before we leave the Oſtrich, who has had but an indifferent Character from us, let us relate all the advantageous Things that we can ſay in her Favour. She furniſhes us with moſt lovely Feathers, very broad and long, ſome white, others black, but which are tinged by Art with all the Variety of Colours: They are placed as Ornaments on the Teſters of Beds, the Canopies of great Men, and the Caps of Children: They adorn the Hats of Gentlemen, and furniſh the Ladies with very pretty

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* Derham, Theol. Phyſ. l. iv. c. 15. & lib. vii. c. 4.

† Ælian. Hiſt. lib. xiv. c. 7. & lib. iv. c. 37.

Fans: They add Height to the Stature of Tragedians; and it muſt be confeſſed, the Theatrical Heroes would loſe a conſiderable Part of their Grandeur, were they diveſted of the Oſtriches Plumes.

Gentlemen, I have preſented you with the leaſt and largeſt of all Birds. You may fix your Choice between theſe two Extremes; the Field is very ſpacious.

Prior. 'Tis ſo ſpacious that I am intirely loſt, and own myſelf confounded by the very Abundance I diſcovered.

Counteſs. Since all Subjects are alike to you, let me appoint each his Part. The *Prior*, as he is a Man of good Taſte, ought to charge himſelf with the Recommendation of Birds valuable either for the Melody of their Notes, or the Beauty of their Plumage. But he ſhall be releaſed from this Taſk, when he has favoured us with a few Words on the Nightingale and Peacock; and he will hardly complain of the Part allotted him. His Lordſhip, as he is a great Sportſman, ſhould preſent us with Birds of Prey; and the *Chevalier* has told me, in a Whiſper, that he has reſerved the Birds of Paſſage for our Entertainment. In my Opinion, theſe are all the Species, unleſs any one has an Inclination to add the Bat and Owl.

Prior. Of all the Claſſes of Birds, none prove more agreeable Companions to Man, than thoſe who enjoy the Gift of Harmony and Speech. But what Pleaſures ſoever they adminiſter, they are all Foils to the Nightingale, who alone charms us as much as the whole Band of the other Species. After we have liſtened to the moſt melodious Symphony, we are agreeably ſurpriſed to hear an excellent Violin, unaccompanied by any other Inſtrument. Let Signior *Geminiani*, in the midſt of a fine Concert, begin a Solo, and enchant us with thoſe Strokes of his Bow, that ſo wonderfully diſtinguiſh him: Every Ear is all Attention; we admire the extraordinary Force with which he draws and modulates his Tones, nor are we leſs affected with the exceeding Softneſs inſeparable from them: He always knows how to diverſify his Play; and his Performance receives an infinite Contraſt from what preceded, and communicates Agreeableneſs and Value to the Airs that follow. He leads the Ear from Wonder to Wonder. All the Audience is tranſported with the Charms of the Harmony; and the moſt ſcrupulous Judges perceive throughout the whole a Multitude and Juſtneſs of Proportions that entertain them, with an entire Orcheſtre in a ſingle Inſtrument. 'Tis the very ſame in a Concert of Birds: After we have heard a full Chorus celebrate the Author of Nature, and proclaim the Bounties of him who ſuſtains them, 'tis an agreeable Novelty, in the Evening to hear the Nightingale begin to ſing by himſelf, and continue his Notes till the Night be far advanced. One would imagine him ſenſible of the Merit of his Accompliſhments; and that it is in Complaiſance to Man, as well as for his own Satisfaction, that he is pleaſed to ſing when all the reſt are ſilent. Nothing animates him ſo much as the Stillneſs of Nature. He then compoſes and executes all his Harmony. He riſes from Solemnity to Sprightlineſs of Sound, and warbles from a ſerious Song to a more ſportive Tranſition, after which he ſoftens the lighteſt Quavers and Diviſions into the moſt languiſhing and plaintive Strains, and at laſt returns to the natural Chearfulneſs of his Melody. One is often tempted to gain a View of the amiable Muſician who ſo obligingly amuſes us each Morn and Evening. We ſearch for him and ſtill he lyes concealed. A great Genius has its capricious Peculiarities. When we only hear him, our Imagination is apt to lend him a ſtately Shape. We ſuppoſe he ought to have a vigorous Breaſt and indefatigable Organs, to furniſh out and ſuſtain, without languiſhing, ſuch a Strength and Gracefulneſs of Sound; ſuch multiplied and ſtriking Proportions, ſuch a prodigious Variety of Muſic; and yet we find it the Throat of a very little Bird, who, without a Maſter, Study, or Preparation, accompliſhes all theſe Wonders.

The Peacock.

What the Nightingale is to the Ear, the Peacock is to the Eye. It muſt be granted, that the Cock, the Wild-Duck, and the King's Fiſher, the Goldfinch, the Parrot, and the Pheaſant, with a Variety of other Birds, are very finely array'd, and we are delighted with the Conſideration of their Ornaments, and the elegant Taſte of their different Veſtures, but when the Peacock appears, every Eye is allured. The Air of his Head; the eaſy Turn of his Shape; the blended Colours of his Body;

the Eyes and clouded Spots of his Tail; the Gold and Azure that ſhine in every Part; the Round of Plumage he draws after him with ſo much Pomp; his Aſpect full of Dignity, and the very Attention with which he unfolds his Ornaments to the Spectators, whom Curioſity aſſembles around him, have a ſingular and raviſhing Effect. This Bird alone is a noble Spectacle; but would you imagine he had any unpleaſing Deficiencies? However, this is the Fatality of the Peacock; he diſſatisfies all his Beholders: He can neither talk nor ſing; his Language is ſhocking, 'tis a Cry capable of inſpiring one with Horror; whereas the Linget, the Linnet, the Thiſtlefinch, and the Parrot, with all the modeſteſt and moſt ſimple Accompliſhments, live with us fifteen Years or more, without giving us a Moment's Diſguſt; they are Creatures of Underſtanding and good Behaviour, and that is ſaying every Thing to their Advantage. A pompous Exterior is a Qualification the leaſt neceſſary to render Society agreeable, and of a long Duration.

I have expatiated, perhaps, too much on the Articles of Adjuſtments and Muſic; and theſe Particulars have but little Correſpondence with my Profeſſion. It will be more graceful for his Lordſhip to entertain us with Falconry, for that is the proper Recreation of a Gentleman.

Count. This Sport is one of the nobleſt, and frequently proves one of the moſt profitable Pleaſures. Mankind have diſcovered the Secret of making even the voracious Quality of Birds advantageous, either by employing them againſt thoſe called Malignants, becauſe they are always warring with the moſt timorous Species, (of this deſtructive Claſs are Kites and Ravens, who attack only Pigeons and Chickens) or elſe by employing them againſt thoſe Birds whoſe Fleſh affords the moſt exquiſite Reliſh, but who live at a great Diſtance from us; ſuch are the Patridge and Pheaſant. For theſe different Sports, the Falcon, the Gerfalcon, the Lanner, the Saker, the Merlin, the Sparhawk, and Goſhawk are much eſteemed: But in general, the Falcon, and Hawk are more ſerviceable, and uſed with greater Frequency than the reſt. The Falcon and all thoſe I named firſt, are in extraordinary Repute, and trained up to various Flights, ſome of which are pointed againſt the

Heron, others againſt the Kite, the Curlew, and the Owl. But theſe Pleaſures are very expenſive, and only fit for Kings or Princes. The Hawk is uſeful in low Flights; he is ſagacious and very dextrous in attacking the Partridge, and is ſure to furniſh the Larder with excellent Game. A prudent Gentleman leaves the Falcon to Princes, and contents himſelf with the Hawk.

The Manner of training up a Bird of Prey.

The Manner of training them up, and employing them in the Field, is very agreeable. Thoſe who are brought up for this Exerciſe are either *Nias* or *Hagard* Birds. Thoſe are called *Nias*, who have been taken in the Neſt, and *Hagards* are thoſe who have enjoyed the Liberty before they were caught. Theſe laſt are tamed with more Difficulty; but Patience and Dexterity ſucceed in that Particular, and, in Terms of Falconry make them tractable and fit for the Fray. When they are too wild, they are neither fed, nor ſuffered to ſleep, for three or four Days, and as many Nights, and are never left alone; by which means they grow familiar with the Falconer, and are obedient to all his Commands. His principal Care is to accuſtom them to ſettle on his Fiſt; to ſpring when he throws them off; to know his Voice, his Singing, or any other Signal he gives them; and to return to Order on his Fiſt. At firſt they are tyed with a String, of about thirty Fathoms in Length, to prevent them from flying away when they are *reclaimed*; and they are not freed from this Confinement till they are compleatly diſciplined, and always return at the Recal. To accompliſh this, the Bird muſt be lured; and I ſhall now acquaint you with the Nature of a *Lure*.

A *Lure* is a Piece of red Stuff or Wood, on which are fixed a Bill, Talons, and Wings. To this is likewiſe faſtened a Piece of that Fleſh on which the Bird feeds; and the *Lure* is thrown out to him, when they intend to reclaim or recal him. The Sight of the Food he loves, with the Addition of a certain Noiſe, immediately brings him back. In a little Time, the Voice alone is ſufficient. The various Plumage, with which the *Lure* is ſet off, is called a *Drawer*. When they accuſtom the Hawk to fly at a Kite, a Heron, or a Partridge, they change the *Drawer* according to the Game in View. When he is to ſpring at a Kite, they only fix the Bill and Feathers of that Bird on the *Lure*: The ſame Care is taken with reſpect to the reſt. And in order to entice the Bird to his Object, they faſten to the *Lure* the Fleſh of a Chicken, or ſome other Fowl, but always conceal it under the *Drawer*, or the Feathers of the Game they propoſe to fly at; to this they add Sugar, Cinnamon, Marrow, and other Flavours, proper to determine the Hawk to one particular Flight rather than another; by which Means, when he is afterwards to ſpring at any real Game, he falls upon his Prey with a ſurpriſing Precipitation. After three Weeks or a Month's Exerciſe in a Chamber or Garden, they begin to make an Experiment of the Bird in the open Fields, and faſten little Bells to his Feet, in order to be more readily informed of his Motions. He is always capp'd; that is to ſay, his Head is covered with Leather, which falls down over his Eyes, to prevent him from ſeeing any Object but that they would have him diſcover; and as ſoon as the Dogs either ſtop or ſpring the Game they are in Queſt of, the Falconer uncaps the Bird, and toſſes him into the Air after his Prey. 'Tis then very diverting to ſee him wing the Air in all the Varieties of Flight; and behold him ſoaring by Degrees and repeated Springs, till the Eye loſes him in the middle Region. He then commands the Plain; contemplates the Motions of his Prey, whom the Diſtance of its Enemy deludes into an imaginary Security, till at laſt he launches upon it with the Rapidity of an Arrow, and bears it to his Maſter, who recalls him. They never fail, in theſe his firſt Eſſays, to preſent him, when he returns to his Fiſt, with the Neck and Entrails of the Prey he has brought. Theſe Gratuities, and the other Careſſes of the Falconer, animate the Bird to perform his Duty; keep him in Regularity, and a proper Fierceneſs of Temper, and particularly prevent him from *bearing away his Bells*; that is to ſay, from flying off, ſo as to return no more, which is an Accident that ſometimes happens.

But I am very much in the wrong, to entertain the *Chevalier* with a Diverſion which, without doubt, he has frequently ſeen.

Chevalier. I have beheld this Sport with Pleaſure, but was never acquainted with the Manner of training up the

Bird; and ſhould be glad to know how the Gentleman, who is your Neighbour, teaches his Falcons to fly at Hares and Rabbits, as well as any other Game.

Count. This is what they call *flying a Bird at the Furr*; and there are ſome Falcons who are taught to *fly at the Furr and the Plume*; or in other Words, they are trained up to fly at a Hare, as well as at a Pheaſant, or any other Game, and the Difficulty is not great. When the Falcon is very tame, they take a living Hare, and break one of his Legs, or elſe they uſe a Hare's Skin ſtuffed with Straw; and after they have fixed to it a Piece of Chicken's Fleſh, or whatever Food the Falcon loves beſt, they tye this Skin with a little Cord of a great Length, the End of which is faſtened to the Girth of a Horſe; and as the Skin is dragged along by that Creature, the Bird imagines it to be a Hare in Flight, which allures him to dart upon it; and by this Means he is taught to diſtinguiſh that Animal.

The Gentleman you mentioned has ſtill a better Method, He has taught Birds to fly at a Roebuck, a wild Boar, and even a Wolf; which is ſometimes very ſerviceable when the Wolves multiply their Breed. The Manner in which he proceeds is this:

He * accuſtoms his young Falcons betimes to eat what is prepared for them out of the Sockets of the Eyes of a Wolf, a Boar, or ſome other wild Beaſt; for which Purpoſe, he preſerves the Head and Skin of the firſt Animal he can kill, and ſtuffs it in ſuch a Manner that the Creature ſeems to be alive, and the Falcons have nothing to eat but what they pick out of the Cavity of the Eyes; when this is done, he begins to move this Figure gradually whilſt the Falcon is feeding. The Bird learns to faſten itſelf to it, tho' the Beaſt is drawn backwards and forwards with a very precipitate Motion. He would loſe his Meal, were he to quit his Hold; which makes him induſtrious and attentive to fix himſelf well on the Skull, that he may dig his Bill into the Eye, notwithſtanding the Motion. When theſe firſt Exerciſes are over, our Gentleman places the Carcaſs on a Cart, drawn by a Horſe in full Speed.

* Gamelli Carreri. Tom. II. p. 253.

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The Bird follows it, and is perpetually feeding; and when they come to fly him in the Field, he never fails to dart on the firſt Beaſt he diſcovers, and immediately faſtens on his Head, in order to ſcoop out his Eyes; this throws the Creature into Agonies, he ſtops and gives the Hunter Time to approach and kill him without any Danger, becauſe the Beaſt is more engaged with the Bird than the Sportſman.

Chevalier. 'Tis not in the Power of Dogs to perform the Services we receive from ſuch Birds.

Prior. Greater Feats than this are ſometimes accompliſhed; and * Eagles themſelves are beneficial to ſome People, without being tamed. I knew a Gentleman who kept an excellent Table, and had only an Eagle for his Steward, who ſupplied him with all the Dainties that were ſerved up.

Chevalier. Had the Steward a good Salary?

Prior. You ſhall hear his Services, and his Gratuity. In a Journey I have already given you ſome Account of, I was in Company with a very curious Nobleman, who had an Inclination to ſee the Antiquities of *Niſmes*, before he came to *Marſeilles*. We took our Rout through *St. Flour*, in order to proceed from thence to *Mende* in the *Gevaudan*, and croſs the *Cevennes*. As he was charged with a Commiſſion from Court, he was every where received with particular Marks of Diſtinction. An Officer of Note, in the Neighbourhood of *Mende*, invited him to paſs a few Days at his Seat, and entertained him in the politeſt Manner he was able. At the firſt Collation he gave us, we obſerved with ſome Surpriſe, that all the wild Fowl brought to the Table wanted either a Head, a Wing, a Leg, or ſome other Part, which occaſioned our Gentleman to ſay very agreeably, that we muſt pardon the Voraciouſneſs of his Caterer, who always taſted what he had prepared before it came to the Table. When we aſked him whom this Caterer might be, and he perceived we grew facetious at this new Mode of Entertainment, he expreſſed himſelf in this Manner: In theſe mountainous

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* Memoirs de la vie de M. Aug. de Thou, l. iv. p. 157. Raii Synopſ. Method. Avium. p. 6.

Parts, which are the richeſt in the Kingdom by reaſon of their Fertility, the Eagles are accuſtomed to build their Airies in the Cavities of ſome inacceſſible Rock, which is hardly to be aſcended by the Aid of Ladders and grappling Irons. As ſoon as the Shepherds have made this Diſcovery, they raiſe a little Hut at the Foot of the Rock, where they ſcreen themſelves from the Fury of theſe dangerous Birds, when they convey Proviſion to their Young. The Male carefully nouriſhes them for the Space of three Months, and the Female is engaged in the ſame Employment, till the Bird is capable of quitting the Airy; but when that Period is compleated, they make him ſpring into the Air, and bear him up with their Wings and Talons, when he is in Danger of falling. Whilſt the young Eagle continues in the Airy, the Parents ravage all the neighbouring Country; Capons, Chickens, Ducks, Lambs, Kids, and Pigs ſuffer on this Occaſion; they ſeize whatever falls in their Way, and bear it to their Young. But the Fields and Woods ſupply them with their beſt Game; for there they deſtroy Pheaſants, Partridges, Woodcocks, Wild-Ducks, Hares and young Fawns. The Shepherds, at the very Inſtant they perceive the old Birds have left their Airy, plant their Ladders and climb the Rocks as well as they are able, and then they carry off what the Eagles have conveyed to their Off-ſpring; and in the Room of what they take, leave the Entrails of certain Animals. But as this cannot be done ſo expeditiouſly, as to prevent the young Eagle from devouring Part of their Food, the Shepherds muſt neceſſarily bring away what has been already mutilated; but in recompenſe for this Diſadvantage, what they thus take has a much finer Flavour than any Thing the Markets afford. The Gentleman added, that when the young Eagle has Strength enough to fly, which requires a conſiderable Time to attain, becauſe he is deprived of an excellent Food, and obliged to take up with what is very indifferent, the Shepherds faſten him to the Airy, that the Parent Birds may continue to ſupply him with what they take, till the diſagreeable Task of providing for an Offspring that perpetually fatigues them, obliges firſt the Male, and then the Female to forſake him. The Male transfers himſelf to a new Situation, and the

Female follows the Track of her faithful Mate; after which their Tenderneſs for another Progeny makes them forget the former, whom the Shepherds leave in the Airy, to ſtarve, unleſs they are compaſſionate enough to remove him.

This is a Fact we were aſſured of by the Gentleman, who acquainted us, that three or four of theſe Airies were ſufficient to furniſh a ſplendid Table throughout the Year; and inſtead of murmuring at the Creator of Eagles and Vultures, he thought himſelf very happy in their Neighbourhood, and reckoned every Airy of an Eagle or Vulture on his Eſtate, equivalent to an annual Rent.

Count. Since the Converſation turns on Eagles, I muſt acquaint the *Prior* that we have a young one in Company, who already begins to fly alone; I mean the *Chevalier*, who came this Morning into my Cabinet, to read and make Examinations, confront Authors, and write Obſervations. We have nothing now to do but leave him to himſelf.

Chevalier. Call me rather a *Nias* Bird, who has never ſeen any Thing. ——— I was anxious to know what became of Swallows, and ſuch a Multitude of other Birds we ſee for a Seaſon, and which ſuddenly diſappear: And I ſhall now declare what I have collected on that Article.

Birds of Paſſage.

Some Birds of Paſſage delight in cold Countries, others are pleaſed with temperate Climates, or even the hotteſt Regions. Some Species content themſelves with paſſing from one Country to another, where the Air or Aliment attracts them at a certain Seaſon. Others traverſe the Seas, and undertake ſurpriſing Voyages. The Birds of Paſſage moſt known are Quails, Swallows, wild Ducks, Plovers, Woodcocks, and Cranes; but there are ſeveral other Species.

In the Spring, Quails paſs from *Africa* into *Europe*, to find a more tolerable and moderate Summer than they could enjoy in the Country from whence they came. * Towards the Cloſe of Autumn, they return over the *Mediterranean*, to obtain, in *Barbary* and *Egypt*, a gentle Heat, correſponding to the Climates they abandoned, when the Sun was on the other Side of the Equator. The Quails take their Flight in Troops that ſometimes reſemble Clouds: They frequently cover Ships, and the Sailors take them without any Difficulty.

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* Bellon.]

Swallows. Swallows ſeem to have a different Procedure. Multitudes of them, as it is pretended, croſs the *Sea*. But the Accounts from *England* and *Sweden* make it evident, that ſeveral, or at leaſt thoſe of the moſt Northern Countries, continue in *Europe*, and conceal themſelves in the Caverns of the Earth rivetted to one another with their Claws and Bills. * They flock to Places unfrequented by Man, or even bury themſelves in the Water. The Precaution they take to lubricate their Feathers with their own Oil, and to roll themſelves up like a Ball, their Head within, and their Back without, preſerves them in the Water, and even under the Ice. They are there benumb'd, and paſs the whole Winter without Motion. The Heart however has a conſtant Palpitation, and the Warmth unchils them at the Return of Spring. They then reviſit their former Habitations, and each Individual finds out his own Country, and his particular Village, City, and Neſt.

As to Wild-Ducks and Cranes, both the one and the other, at the Approach of Winter, fly in queſt of more favourable Climates. They all aſſemble at a certain Day, like Swallows and Quails. They decamp at the ſame Time, and 'tis very agreeable to obſerve their Flight. They generally range themſelves in a long Column like an I, or in two Lines united in a Point, like a V reverſed. The Duck, or Crane, who forms the Point, cuts the Air, and facilitates a Paſſage to thoſe who follow; but he is charged with this Commiſſion only for a certain Time, at the Concluſion of which he wheels into the Rear, and another takes his Poſt. They have the Reputation of many other Dexterities; but his Lordſhip has adviſed me not to be too credulous in that Particular, and has conſequently abridged my Quotations.

Counteſs. I have frequently heard People talk of a Species of little Men a Foot and a half high, who, as they ſay, make War with the Cranes at their Arrival on the Coaſts of the Red Sea: I think they call them Pygmies.

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* See the Account given to the Royal Society at London 12 Feb. 1713. Philoſophical Tranſactions and Journal of the Learned, 1666. and 1667.

Prior. Theſe little Men are the Apes, who battle the Cranes in Defence of their Young, which theſe Birds endeavour to deſtroy.

Counteſs. Though it has been familiar to me, every Autumn, to take notice of a certain Day when the Swallows meet, in order to depart all together, and notwithſtanding I have frequently ſeen Flights of Birds on their Journey, I always thought the Fact very miraculous. In their Progreſs over Seas and Kingdoms, I was at a Loſs whether I ſhould moſt admire the Force that ſuſtains them in ſo long a Paſſage, or the Order in which the Whole is accompliſhed. Who acquainted their Young, that it would ſoon be neceſſary for them to forſake the Land of their Nativity, and travel into a ſtrange Country? Why do thoſe who are detained in a Cage, expreſs ſo much Diſquietude at the Seaſon for the uſual Departure, and ſeem to be afflicted at their Inability to join the Company? What particular Bird charges himſelf with the Care of aſſembling a Council, to fix the Day of their Removal? Who ſounds the Trumpet to inform the Tribe of the Reſolution taken, that each Party may be prepared? Whence have they their Almanack to inſtruct them in the Seaſon and Day, when they are to be in Motion? Are they provided with Magiſtrates to preſerve the Diſcipline which is ſo extraordinary among them? For not one of them diſlodges till the Proclamation has been publiſh'd, and not a Deſerter is to be ſeen on the Day that ſucceeds their Departure. * Have they Charts to regulate their Voyage by? Are they acquainted with the Iſlands where they may reſt, and be accommodated with Refreſhments? Are they furniſhed with a Compaſs to guide them infallibly to the Coaſt they would ſteer to, without being diſconcerted in their Flight by Rains, or Winds, or the diſmal Obſcurity of many Nights? Or are they endued with a Reaſon ſuperior to that of Man, who has not Courage to attempt ſuch a Paſſage, without a Multitude of Machines, Precautions, and Proviſions?

Prior. 'Tis very certain, Madam, they have neither Charts, nor Compaſs, nor Reaſon; the Deity alone is their

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* Explic. de l'ouv. des 6 jours.

Conductor, and impreſſes on each Individual, a particular Method and Train of Sentiments that ſuffice for their Condition.

Count. If theſe Operations were the Reſult of a Reaſon that was proper and perſonal to them; if God had abandoned them to their particular Underſtanding, that very Faculty, which appears in them ſo admirable and extenſive, would not always be ſubject to the ſame Formality of Action.

Prior. Without doubt, for all the Individuals of the ſame Species, if they had the ſame Rule and Principle of Conduct we poſſeſs, would vary in their Apprehenſions like ourſelves. The Swallows in *China* would not build like thoſe in *France:* The *Aſiatic*, the *Greek*, and the *Roman* Taſte would prevail among them; and as the two latter would be cultivated by the Swallows of *Italy* and *England*, theſe would look with Compaſſion on the *Chineſe* Architecture; and even in *France*, the Swallows of *Paris* would not build and live like their Provincial Brethren; without doubt, they would follow the Mode, and communicate it to the reſt; they would afterwards deſpiſe that very Mode as a ridiculous and *Gothic* Taſte, when they had once taken it into their Heads to eſtabliſh another. Were Swallows poſſeſſed of Reaſon, it would introduce Subordination. The moſt rational or enterprizing among them would doubtleſs acquire the firſt Station in the Community; and, by a neceſſary Conſequence, the Swallows of Diſtinction would not mix with the Vulgar, but leave the Labour to them. They would make a ſerious Affair of Chirping with greater Delicacy than the reſt; they would refine on the Manner of poliſhing their Feathers, and adjuſting their Behaviour; they would aſſume what is called a fine Air, and thoſe who made the lateſt Appearance would be more graceful than their Elders. In a Word, if Swallows had the Faculty of Reaſon, they would perpetually invent, reform, and perfect, and, like ourſelves, do a thouſand rational and important Things, of which, at preſent, they have not the leaſt Idea.

Counteſs. You have a great deal of Reaſon to rally our Extravagancies. The Beaſts have that Simplicity and Decorum of Conduct, as would incline one to believe they were endued with Reaſon; and our Actions are frequently ſo capricious and indiſcreet, that one would imagine we did not reaſon at all.

Prior. 'Tis evident however, that the Operations of Beaſts are attended with ſo much Certainty, only becauſe an Almighty Providence has regulated the Circumſtantials; whereas the Inequality that appears in the Conduct of Men, demonſtrates their Enjoyment of a Reaſon which varies in its Limitations, and a Liberty as diverſified in its Choice. But we wander from the Subject; let us return to the Inhabitants of the Air.

Chevalier. Are there any left who deſerve a particular Attention?

Night Birds. *Prior.* I can think of none but the different Species of Night Birds. * All the other Tribes ſing before the Sun riſes, and perform the ſame Homage to him after he is ſet: But amidſt this general Applauſe that is paid to the Light, the Birds of Darkneſs are alone implacable againſt it: They avoid it as their Enemy, never permit it to be the Spectator of their Actions, and whilſt it illuminates the Univerſe, they conceal themſelves in Dens of the deepeſt Gloom. They wait with Impatience for the Return of Darkneſs, that they may ſteal out of their Priſons, to which the Day-light had baniſhed them, and they then teſtify their Joy by Screams, that are only capable of infuſing Horror and Conſternation into the Minds of all who hear them; for each of theſe Birds has its particular Cry, according to the Species, but they are all very doleful and alarming. Their Figure diſcovers ſomething hideous and gloomy; and one would imagine he ſaw a ſettled Averſion againſt Man and all Animals, low'ring in their Features. Almoſt all of them have a hooked Bill, and ſharp Talons, out of which the Prey, when once ſeized, has no Poſſibility of Eſcape; and they employ the Hours of Darkneſs and Slumber in ſurpriſing other Birds who are taking their Repoſe, the moſt vigorous of whom with Difficulty elude them, but the weakeſt are their infallible Prey. They likewiſe add Craft to Cruelty, and Artifice to Rage; and after they have kept Watch for the public Calamity, they retire, before the Riſing of the Sun, into Caves inacceſſible to the Light. They generally prefer old Caſtles, and mouldering Piles, to any other Retreat, as if melancholy Ruins and Deſolation, which intimate the Neglect of the Maſter, or the Declenſion of Families, were capable of inſpiring Sentiments of Alacrity in theſe fatal Birds.

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* Explic. de l'ouvr. des 6 jours.

'Tis impoſſible, in collecting all theſe Particulars, not to trace out the Image of thoſe Dæmons of Malice and Darkneſs, who are put to Flight by the Luſtre of Youth; who delight in every Thing that clouds it; take Advantage of the Hours of Negligence and Sleep, to devour the Souls they detain in Fetters of Iron, when they have once ſeized them; who nouriſh themſelves with their Calamities and Loſſes, and reſide, with the greateſt Satisfaction, in perverted and ruined Hearts. The holy Scripture authorizes this Parallel between Dæmons and Birds of the Night, and confirms us in the Belief, that God, whoſe Wiſdom is infinite, has repleniſhed the Proſpect and Order of Nature with profitable Inſtructions for Salvation. *Babylon*, * ſays the Scripture, is become the Habitation of Devils, and the Hold of every foul Spirit, and a Cage of every unclean and hateful Bird.

As the Birds of Darkneſs are Enemies to every other Claſs, they, in their Turn, are equally deteſted; and when the Owl, the Horn-Coot, the Oſprey, and the like, are diſcovered, and detected by their Cries, or any other Accident, there is a general Aſſociation againſt the diſmal Bird. The ſmall and great ſurround him with a loud Noiſe, though it is but ſeldom he is attacked with much Impunity. The Fowlers find their Account in this public and declared Averſion, when they ſpread their Nets for thoſe who imprudently ruſh out, at the real or imitated Cry of one of theſe Birds, who is ſuch an Enemy to the reſt. For they build a Hut near a Wood, and cover it with the Branches of Trees, and then, in ſeveral Parts of the Hut, fix Lime-twigs, on which the Birds of all Kinds deſcend and perch, the better to inſult their Adverſary, whoſe Cry revives their Animoſity againſt him; and when they fall with the Lime-twigs that are not ſtrongly fixed, they ſoil and embarraſs their Wings in the Glew, and loſe both Liberty and Life in the Hands of the Fowlers, who are attentive to obſerve their Fall, and take Advantage of their Raſhneſs.

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* Revelations xvii. 2.

Counteſs. This little Sport is very entertaining. You are no Stranger to it, *Chevalier,* I ſuppoſe.

Chevalier. I know it is called the Decoy, and have frequently heard it mentioned; but it is a Pleaſure that has been only promiſed me as yet.

Counteſs. We muſt give you the Enjoyment of it then.

Count. No later than to-morrow; but can you riſe before the Sun?

Chevalier. I will take upon me to wake the whole Houſe.

Count. Let us go then, and order the neceſſary Preparations.

Chevalier. It ſhall be my Buſineſs to collect all the Cages in this Houſe, as well as the *Prior*'s, and thoſe of the whole Village.

Count. We will furniſh you with every Thing, without obliging you to go any where elſe; and, believe me, you ſhall always have more Cages than Birds.

The End of the Eleventh DIALOGUE.

TERRESTRIAL ANIMALS.

DIALOGUE XII.

The COUNT, *and* COUNTESS.
The PRIOR, *and* CHEVALIER.

Terreſtrial Animals.

Counteſs. PRAY, tell me, Sir, whilſt we are waiting for our Company, which Sort of Life is moſt agreeable to you, that of an Academic, or that of a Fowler?

Chevalier. That of an Academic is more inſtructive.

Counteſs. That's the Anſwer of a true *Norman.* Speak to me without Reſerve, if one ſhould propoſe to you a Lecture in Philoſophy, or a ſecond Decoy in the Woods, how would you determine?

Chevalier. I would immediately prepare the Limetwigs.

Counteſs. This is natural and undiſguiſed: But however, inſtead of the Decoy, which cannot be frequently repeated, becauſe the Birds are ſhy of approaching the Place where the Net has been ſpread, and then you muſt build a new Hut; I ſay, inſtead of this, I promiſe to entertain you with the Diverſion of Fiſhing, as often as you pleaſe, which will be equally amuſing. In the mean Time, let us ſingle out the large Beaſts, and turn the Converſation to Terreſtrial Animals. But here are our Company.

Gentlemen,

Gentlemen, if you are not diſſatiſfied at my regulating the Subjects of our former Converſations, permit me to continue in that Province. If I ſhould let you chuſe, you would perhaps convey me into a Country of which I have no Map. After our Speculations on Inſects and Birds, it would not be improper to proceed to Terreſtrial Animals, ſuch as the Sheep, the Ox, the Lion, and the Elephant himſelf, if you pleaſe; for my own Part, I ſhall confine myſelf to what is moſt common.

Count. Thoſe Creatures, Madam, who are moſt common, deſerve our ſtricteſt Attention. We need not go to *Aſia*, to diſcover Subjects for Admiration, ſince we are ſurrounded with them at Home.

Counteſs. I deſire, Gentlemen, you would chuſe *Aſia* and *Africa* for yourſelves, and, if you pleaſe, you may take in *América*; here certainly is enough to give you Satisfaction. If you take the common Animals, you deprive me of all my Quota, and your Preſident will have nothing to ſay.

Prior. The Subject is copious, and will never be exhauſted by our dividing it. Domeſtic Animals alone would furniſh out twenty Converſations. *Chevalier*, be pleaſed to open the Conference. Without any Study or Preparation, you will be ſenſible of one of the fineſt Inſtances of the Deity's Bounty to Man, only by your anſwering a ſingle Queſtion. If one ſhould ſearch the Woods for a Set of young Wolves, a Number of Fawns, and as many young Lions, would it not be poſſible to bring them up, to tame and diſtribute them in three Claſſes, according to their Species, and nouriſh them in the Fields, like Sheep and Calves?

Chevalier. It would be altogether impracticable. I am ſenſible we might rear them, and ſoften a little of their Fierceneſs; but theſe Animals have always a ſavage and traiterous Diſpoſition. One could never keep them long, and much leſs lead them by Droves.—— We had two young Wolves brought up at our Houſe, who ſeemed to be very ſociable, but they ſoon took Care to undeceive us. The ſly Animals were pleaſed one Morning to quarrel with a Dog, and thought fit to tear him to Pieces; they likewiſe did us the Favour to kill three Kids, and then marched off to the Woods.

Prior. You have imagined till now, that this Union of a large Herd of Cows, or a Flock of Sheep or Goats under the Conduct of a ſingle Shepherd, or the Wand of a Youth, was the Conſequence of Man's Induſtry. But what Opinion do you entertain, when you conſider this Matter with a little Attention?

Chevalier. I am very ſenſible that this Union is the Work of God alone, and one of the moſt amiable Preſents he has condeſcended to make us.

Prior. Were it poſſible to tame Lions and Bears, yet we could never make them labour, or carry Burdens; but granting even this to be practicable, would they ſubmit to feed on the Herbage of the Field? Education never changes Nature; and were they to be nouriſhed according to their libertine and ravenous Inclinations, they would ſoon ruin their Maſter, inſtead of aſſiſting him in his Labours; on the contrary, the generality of domeſtic Animals are but little expenſive, they work hard, and the Habitations of Men are more agreeable to them than their own Liberty. They are furniſhed with great Strength, they employ it only in their Owner's Service; and immediately obey his firſt Command. What Gratuity do they expect for their Toil? Why true a little Glaſs, and even the very drieſt, or leaſt valuable of all our Grain, ſuffices them: The moſt delicious Food has no Attractions for them, and they reject it with as much Averſion as if it were Poiſon. Has any Part of our Care produced in them Inclinations ſo abſtemious and beneficial to us? Are they formed by our Induſtry? No certainly, and the *Chevalier* has very juſtly called them, one of the Deity's moſt amiable Preſents.

Counteſs. One muſt be either blind or ungrateful to deny this Truth; for theſe Creatures are not only tractable, but naturally loving; they come to tender us the Variety of their voluntary Services, and never keep themſelves at a Diſtance from us. Whereas the others, who are not preordained to ſhare our Labours, content themſelves with doing us no Injury, unleſs they are, in a manner, compelled to it, and retire to Woods and Deſerts, out of reſpect to Man, to whom they reſign all the reſt of the Earth.

Chevalier. Providence diſcovers itſelf in the benevolent Inclinations implanted in domeſtic Animals. But I would willingly know how we can reconcile the voracious Diſpoſitions of wild Beaſts, with the Goodneſs of God: Does a Wolf, who darts on a Flock of Cattle, ſeem a proper Object to do Honour to his Providence?

Prior. He undoubtedly honours it in his Sphere, ſince he accompliſhes the Views propoſed in his Creation. Providence has formed ſome Animals to live with Man, and be ſerviceable to him; and has created others, to people Woods and Deſerts, animate every Part of Nature, and chaſtiſe Morals when they grow impious and abandoned. The ſame Providence appears admirable, in the Complacency it infuſes into Animals, who live for the Benefit and Support of Mankind; and is its Intention leſs conſpicuous, in the Preſervation of all thoſe ſavage Beaſts, whom it nouriſhes in Rocks and Solitudes, without Folds or Paſture, without Magazines, or any other Aſſiſtance of Man's Contribution; or rather, in Oppoſition to all his Endeavours to deſtroy them? And who with all theſe Diſadvantages are better accommodated with every Neceſſary, have more Activity for the Chace, are ſtronger, better nouriſhed, and endued with more Vivacity, are cloathed with a finer Skin, and have a completer Turn of Shape, than the Generality of thoſe who have Man for their Purveyor.

Counteſs. You ſee, *Chevalier*, that Providence ſhines and operates through all its Works, and rather merits our Adoration, than Criticiſms in Matters above our Comprehenſion. But I deſire we may return to our domeſtic Animals, and talk of things accommodated to my Capacity. Let his Lordſhip, for Inſtance, give us a Detail of his Horſe's Perfections. The *Chevalier* may celebrate his Dog, whoſe Shape and Addreſs he is ſo frequently boaſting. I, as a good Oeconomiſt, declare for the Cattle, and the *Prior* is at Liberty to diſtinguiſh all the reſt.

The Horſe.

Count. I am very well ſatisfied with my Province. If Cuſtom had not dignified the Lion with the Title of King of Beaſts, Reaſon, in my Judgment, would confer it on the Horſe. The Lion is nothing leſs than the King of Animals; he is rather their Tyrant, ſince he is only capable of devouring, or inſpiring them with Terror: On the contrary, the Horſe is never injurious to other Creatures, either in their Perſons or Properties: He diſcovers nothing that can expoſe him to the leaſt Averſion; he poſſeſſes no bad Quality, and enjoys all thoſe that are amiable: Of all Animals, he has the fineſt Turn of Shape, is the moſt noble in his Inclinations, the moſt liberal of his Services, and the moſt frugal in his Food. Caſt your Eyes on all the reſt: Do you ſee on whoſe Head diſcloſes ſo much Beauty and Gracefulneſs? Can we diſcover any Eyes that ſparkle with more Fire? Where do we behold a more ſtately Cheſt, a lovelier Body, a Main that floats in the Wind with greater Majeſty, and Limbs of a completer Flexibility? Let him be managed by his Rider, or diveſt him of his Bridle, and ſuffer him to expatiate in full Liberty through the Fields, you will obſerve, in all its Attitudes, a noble Deportment, and an Air which makes an Impreſſion even on thoſe who are leaſt acquainted with his Virtues. He is ſtill more engaging in his Inclinations, and indeed can properly be ſaid to have but one, which is to render Service to his Maſter. Is he required to cultivate his Land, or carry his Baggage? he is always prepared, and would ſooner ſink under the Weight of his Labours, than decline them. Is he to bear his Maſter himſelf? he ſeems ſenſible of the Honour, he ſtudies how to pleaſe him, and, at the leaſt Signal, varies his Pace, is always ready to ſlacken, redouble, or precipitate it, when he is acquainted with his Rider's Will. Neither the Length of a Journey, nor the Unevenneſs of the Way, nor Ditches, nor Rivers the moſt rapid, can diſcourage him, he ſprings through every Obſtacle, and as a Bird whoſe Career no Impediment can check. Is he called to any other Service; is it incumbent on him to defend his Maſter, or bear him to the Attack of an Enemy? * he goeth out to meet the armed Men, he mocketh at Fear, and is not affrighted: The Sound of the Trumpet, and the Signal for Battle, awaken his Courage, and he retreats not at the Sight of the drawn Sword.

Counteſs. But this is a Panegyric, my Lord.

Count. I had a thouſand Deſcriptions to make of the Boundings and other majeſtic Airs of a Horſe; but ſince you rally me for the firſt Part of a Commendation that was unſtudied, and couched in the moſt military Strain, you muſt excuſe me from giving you the Second. Now, *Chevalier*, produce your Dog, and let us have a Liſt of his Accompliſhments.

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* Job. xxxix. 20.

The Dog.

Chevalier. I ſhould be glad to ſee him here; for he is more agreeable than any Deſcription of mine can render him: He is called *Mufti*, and is the King of *Shocks*. He has all that's pleaſing in his Make; large Ears, graceful Whiſkers, and a Ruff perpetually white. He has no Deficiency in his Exterior, and, with all this, has been well broke, and performs his Exerciſes with a peculiar Grace. He can hunt, dance, leap, and ſhew a hundred Dexterities: Among others, he brings to the Company, all the Cards any of them have named.

Counteſs. How is it poſſible to train up Animals deſtitute of Reaſon, to theſe Feats?

Chevalier. They have, at leaſt, a certain Degree of Memory. A Dog is firſt taught, by repeated Trials, to know ſomething by a certain Mark, and then to diſtinguiſh one Ace from another; they frequently offer him Food on a Card he is unacquainted with, after which they ſend him to find it out from the reſt, and he never miſtakes. The Habit of profiting by that Diſcovery and receiving Careſſes, enables him, by Degrees, to grow acquainted with each particular Card, and he brings them with an Air of Gaiety, and without Confuſion; and in Reality, 'tis no more ſurpriſing to ſee a Dog diſtinguiſh one Card from thirty others, than it is to ſee him diſtinguiſh, in the Street, his Maſter's Door from the reſt in the Neighbourhood. But *Mufti* pleaſes me moſt with his Diſpoſition, and the little Policies natural to him. When I take my Books to go to the College, my poor Dog, who knows he is to be abſent from me three Hours, puts on a melancholy and diſcontented Air: He plants himſelf before my Door, and waits for my Return: But if, inſtead of my Books, I take my Sword, and only mention the Word *abroad*, he flies to impart his Happineſs to all the Neighbourhood; he runs up and down, and barks in ſuch a Manner, as makes it impoſſible for any one to forbear laughing. If I make it long before I go out, he ſeems to ſuſpect I am conſidering how to diſpoſe of him; he marches off by way of Prevention, and waits for me at a conſiderable Diſtance from my Lodgings, full of Hopes to be one of the Party. If I tell him, that muſt not be, he expoſtulates with me, and endeavours to prevail on me to revoke my Orders: He puts on an Air that deſervedly pleads Compaſſion, when he is poſitively told, that he muſt return Home; but there is no Inſtance of Gratitude which he does not teſtify, when I ſay to him, *Let us be gone.* But the Affair is quite otherwiſe, after I have been abſent ſome Days; he imagines I return merely on his Account, commits a thouſand Extravagancies, and a Couple of Hours are not ſufficient for him to make me ſenſible of all he has at Heart.

His Friendſhip does not end there; he ſeems to watch Night and Day, to preſerve me from being injured by any one. He is acquainted with all that paſſes, and gives me Intelligence of each Particular; but makes no Uſe of his Information, but what is conformable to my Orders; he reads his Behaviour in my Eyes, and when any one aſſaults me, a drawn Sword would not intimidate him. Some Months ago I began to practiſe Fencing, and the firſt Time I took my Leſſon, he faſtened on my Maſter's Leg; and ever ſince they are upon ſuch indifferent Terms with each other, that I am obliged to ſeparate them.

Count. In Reality, all the moſt ingenious Qualities a Dog is capable of acquiring, are not half ſo valuable as thoſe lively and courageous Inſtances of Friendſhip he diſcovers for his Maſter; and it is evident, that God has conſigned the Dog to Man, to ſerve him as a Companion, and to aid and defend him. The Services we receive from Dogs are as various as their Species.

The Maſtiff and the Bull-dog guard our Houſes in the Night, and reſerve all their Malignity for the Seaſon wherein People may form bad Deſigns againſt us. The Shepherds Dogs are equally qualified to aſſault the Wolves and diſcipline the Flock. Among the Claſs of Sporting Dogs, the Terrier has very ſhort Legs, to enable him to creep under the Graſs, and dart through Brakes and Buſhes. The Greyhound to facilitate his Speed through the Air, has received a ſharp Head and a ſlender Body: His Legs, that are ſo long and ſpare, ſtretch over a large Space of Ground, and in Swiftneſs he even exceeds the Hare, whoſe whole Safety conſiſts in the Promptitude and Stratagems of her Flight. The Greyhound is the Contraſt to the Terrier, as well in the Structure of his Body, as in his particular Functions: The latter has a weak Sight, and a fine Noſe, becauſe he is in greater need of a ſure Scent than a piercing Eye, when he buries himſelf under Ground, or forces his Way through a thick Underwood: On the other hand, the Greyhound, who is only uſeful in the Plain has but an indifferent Noſe, but then he never fails to ſee and diſtinguiſh his Prey at a Diſtance through all her Doublings. The Setting Dog ſtops and ſquats down when he ſees the Game, to give his Maſter Notice of the Diſcovery. There are ſeveral Sorts of theſe Dogs, whoſe Names vary according to their Qualifications; but they are all equally zealous and faithful in accompliſhing the Service preſcribed them*. The Maſter, who is ſeldom ſatisfied with thoſe Friends who accompany him, and are irregular at the Sport, is however charmed with the Capacity and Underſtanding of all his Dogs. At the Concluſion of the Chace, and the ſhort Satisfaction of the Carnage, which is not always granted them, they all return to the Kennel and the String; they then forget their Fierceneſs, make a gay Surrender of their Liberty, and without murmuring ſubmit to the coarſeſt Food. 'Tis ſufficient for them to have regaled their Maſter with excellent Veniſon, and a polite Amuſement.

In a Word, among all theſe various Domeſtics, who are ſo ſubmiſſive and devoted to our Intereſt, there are none, even down to *Spaniels* and the *Daniſh* Breed, but what render themſelves agreeable by their Sprightlineſs, valuable by their Aſſiduity, and ſometimes beneficial, by a ſeaſonable Intimation given to their Maſter in his Slumbers. Among Animals, I know but very few, beſides the Horſe and Dog, with whom one can maintain a friendly Intercourſe; and therefore the Proverb ſays, that a Man, a Horſe, and a Dog, are never weary of each others Company.

Counteſs. Mankind have a commodious Vehicle in a Horſe, a faithful Guard in a Dog, and in both, an agreeable

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* Explic. litt. de l'ouv. des 6 jours.

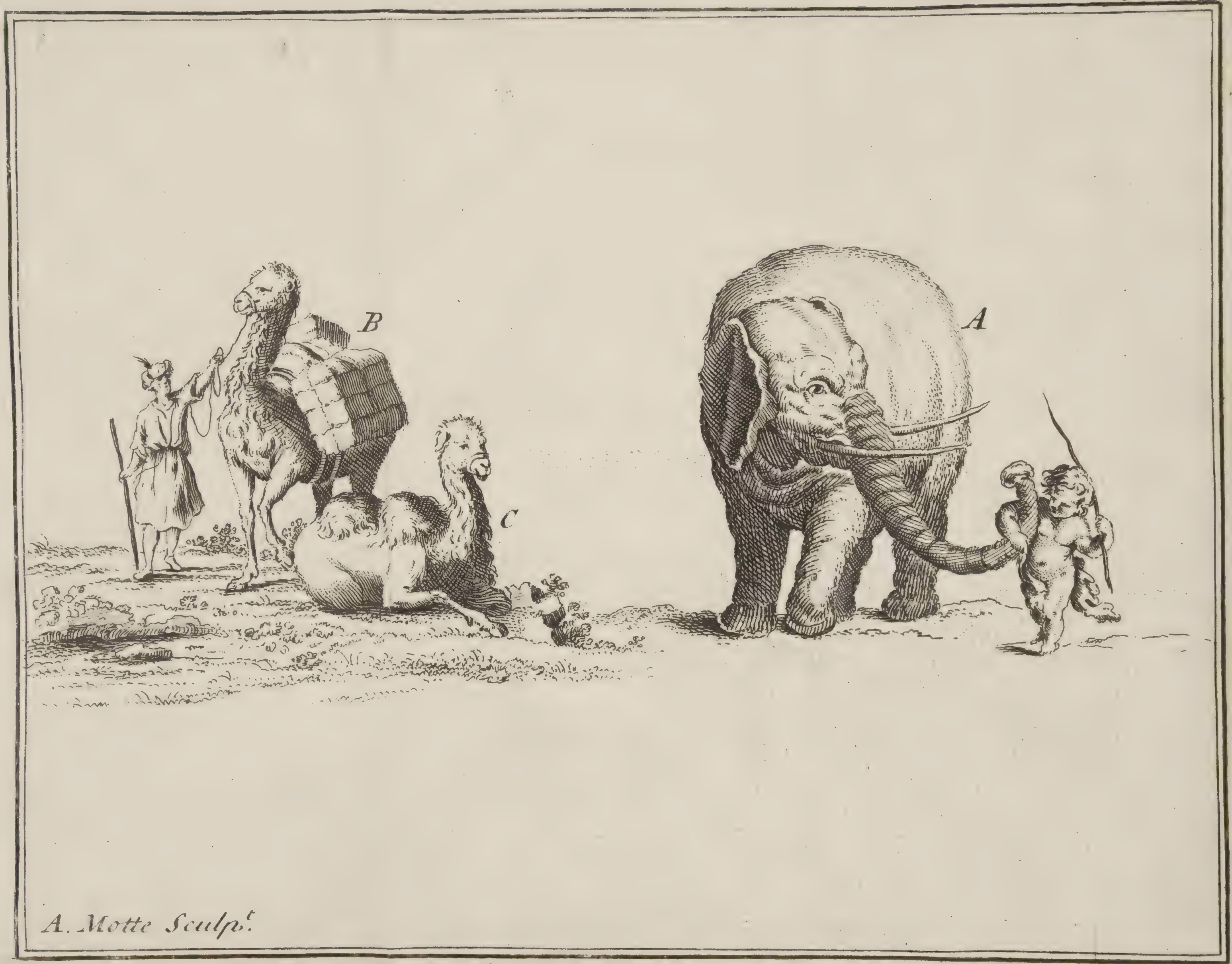
able and conſtant Amuſement. But there are Things ſtill more neceſſary for him to enjoy, ſuch as Food and Raiment, and theſe he is ſupplied with by the Cattle. The Fleſh of theſe Animals is ſo nouriſhing and perfect, that we leave the moſt exquiſite Delicacies to return to them, and are never ſatisfied with the Collations they afford us. Whilſt we permit them to live, how do they employ their Time? It is evident that the Cow, the Goat, and the Sheep, have been placed among us to increaſe our Riches: We feed them with a few Herbs, or allow them the Liberty to range in the Fields, and ſupply themſelves with thoſe Productions that are leaſt beneficial to us, and they return every Evening, to repay this Obligation with a liberal Flow of Cream and Milk. The Night is no ſooner paſſed, but they earn, by a ſecond Payment, the Suſtenance of the ſucceeding Day. The Cow alone furniſhes the Poor with what ſuffices them next to Bread; and crowns our Tables with Riches and the moſt delicious Variety. The Sheep, content to be array'd only in Winter, reſigns to us the Uſe of his Fleece in the Summer. In a Word, we derive from this Set of Animals, as well as thoſe who are leſs regarded, an hundred other Conveniencies, which we cannot receive from thoſe who fly from Man. The wild Beaſts never approach us but with a View to rob us; the domeſtic Animals aſſociate with us, for no other Reaſon, but to favour us with their Donations; and if the Value of their Preſents is any way diminiſhed, it is becauſe we daily receive them, and think no more of them; they are depreciated by the Eaſineſs of obtaining them. But, in Reality, this is a Circumſtance which enhances their Merit. A Liberality that knows no Interruption, and is daily repeated, is ever worthy of new Returns of Gratitude; and the leaſt we can do when we receive a Benefit, is to vouchſafe an Acknowledgment to the Donor.

Theſe Animals are perpetually before our Eyes, and I daily diſcover ſome new Traces of a wiſe Ordination and a benevolent Providence. When I conſider a Dam, I behold a Tenderneſs in her for her Young, that reaches even to Exceſs. The Young has no Knowledge of any Thing, and is in a perfect State of Incapacity: But the Fondneſs of the Mother ſupplies every Deficiency, and her Off-ſpring has all its Neceſſities relieved. If I caſt my Eye on this Young, it is a new Object of Admiration, through all the Variety of its Progreſs: Before he is capable of ſeeing, it can find the Teat, and tho' it be ignorant of the Neceſſity of preſſing it, the Creature very dextrouſly employs its two fore Paws alternately, and by theſe means preſſes out the Nouriſhment. If the Parent and her Offspring are ſeparated for any Time, they ſeek one another with equal Impatience; and when they are near enough to be heard, they give mutual Notice by Cries, that are perfectly intelligible to them: The Mother can diſtinguiſh the Bleating of her Young, amidſt a thouſand Lambs; and this, amidſt the Cries of a thouſand Mothers, knows the Voice of the Parent who anſwers her. The Shepherd himſelf is deceived, but the Dam and her Young are never miſtaken, and the mutual Informations they give of their Arrival, are ſoon ſucceeded by a grateful Re-union.

When the Young becomes ſtrong, and capable of providing for himſelf, it is but reaſonable that the Parent ſhould be diſcharged from that Care; ſhe accordingly drives him away, and treats him with Severity, if he perſiſts in following her; and the Tenderneſs of the one continues no longer than the Neceſſities of the other; the Young, deprived of his Milk, is obliged to habituate himſelf to a leſs delicate Food; he learns to nibble the Graſs, and ruminate in the Night, what he had cropped and reſerved in the Day. By degrees he diſtinguiſhes the Seaſons: In the long Days of Summer, he reſts and ruminates, becauſe he may do both without Hazard; but in the Winter, when the Days are ſhort, he has no Time to loſe; he eats with as much Diſpatch as poſſible, and compleats the Digeſtion, by re-chewing the Food at his Leiſure in the Night.

One might make a thouſand Obſervations more on domeſtic Animals, but I am curious to know what the *Prior* has reſerved for us.

Prior. The Animal, whoſe Panegyric I am going to make, has a Set of Qualities very peculiar. He is not uſed in all Places, but his Services are very extenſive and profitable to Mankind; the whole World cannot produce a more laborious Creature, and at the ſame time, one



A. A tame Elephant. B. A Camel loaded. C. A Camel lying down to be unloaded.

more indefatigable, abſtemious and patient. You imagine perhaps, I am ſpeaking of the Elephant, who, if People are ſo inclined, may be taught to obey a Child, and bears on his Back Towers fill'd with Warriors, without being intimidated at the Havock of the Battle; or you may think I mean the Camel, who is ſerviceable in long Journies, is able to carry a thouſand Pound Weight, croſſes Deſarts without drinking, and, as ſoon as he arrives at the Inn, obligingly bends his Knees, and lowers himſelf to the Earth, in order to facilitate the Diſcharge of his Burden: Theſe Creatures have their Merit, but the Animal who is to be the Subject of my Diſcourſe, is abundantly more uſeful, and more generally employ'd.

The Elephant and Camel.

Chevalier, May we know his Name?

Prior. Since I muſt declare it, it is the Aſs.

Chevalier. Bleſs me, Sir, what a Choice have you made?

Counteſs. Had you no Animal to introduce but this; Why did you not take the Cat, who is ſo very ſerviceable? She is diverting in her Play: You would have a hundred Things to ſay, and a Number of Applications to make, with reſpect to her hypocritical Mien; her Paw ſo ſoft, and yet armed with Tallons, her Craft, her Stratagems, and perpetually deſigning March: There would be Matter enough to exerciſe your Style.

The Cat.

Prior. All the World gives up the Aſs! and therefore I intend to take him under my Protection. This Animal, conſidered in a particular Light, gives me a great deal of Pleaſure; and I hope to make it evident, that far from needing any Candour or Apology, he may be the Subject of a reaſonable Panegyrick.

I confeſs, the Aſs is not Maſter of very ſhining Qualities; but then he enjoys thoſe that are very ſolid. If we reſort to other Animals for diſtinguiſhed Services, this at leaſt furniſhes us with ſuch as are moſt neceſſary. His Voice is not altogether melodious, nor his Air majeſtic, nor his Manners very lively; but then, a fine Voice has very little Merit with People of Solidity. With him, the Want of a noble

The Aſs.

ble Air has its Compenſation in a mild and modeſt Countenance; and inſtead of the boiſterous and irregular Qualities of the Horſe, which are frequently more incommodious than agreeable, the Behaviour of the Aſs is intirely ſimple and unaffected; no ſupercilious and ſelf-ſufficient Air. He marches with a very uniform Pace, and though he is not extraordinary ſwift, he purſues his Journey for a long Time, and without Intermiſſion. He finiſhes his Work, in Silence, ſerves you with a ſteady Perſeverance; and diſcovers no Oſtentation in his Proceedings, which is certainly a conſiderable Accompliſhment in a Domeſtic. His Meats require no Preparation, for he is perfectly well contented with the firſt Thiſtle that preſents itſelf in his Way; he does not pretend any Thing is due to him, and never appears ſqueamiſh or diſſatisfied; he thankfully accepts whatever is offered him; he has an elegant Reliſh for the beſt Things, and very civilly contents himſelf with the moſt indifferent. If he happens to be forgotten, or is faſtened a little too far from his Fodder, he intreats his Maſter, in the moſt pathetic Language he can utter, to be ſo good as to ſupply his Neceſſities. 'Tis very juſt that he ſhould live, and he employs all his Rhetoric with that View. When he has finiſhed his Expoſtulations, he patiently waits the Arrival of a little Bran, or a few withered Leaves; and the Moment he has diſpatched his haſty Meal, he returns to his Buſineſs, and marches on without a Murmur or Reply. Theſe are certainly very valuable Accompliſhments. Let us now ſee how he is employed.

His Occupations have a Tinge of the Meanneſs of thoſe who ſet him to work, but the Judgments that are formed both of the Aſs and his Maſter, are equally partial. The Employments of a Judge, a Man of Conſequence, and an Officer of the Revenue, have an important Air, and their Habit impoſes on the Spectators: On the contrary, the Labour of the Peaſant has a mean and contemptible Appearance, becauſe his Dreſs is poor, and his Condition deſpiſed. But we really make a falſe Eſtimation of theſe Particulars. 'Tis the Labour of the Peaſant which is moſt valuable, and alone truly neceſſary. Of what Importance is it to us, when a Manager of the Revenue glitters from Head to Foot with Gold? We have no Advantage by his Labours. I confeſs Judges and Advocates are, in ſome Meaſure neceſſary, but they are made ſo by our Follies and Miſbehaviour; for they would no longer be wanted, could we conduct ourſelves in a rational Manner: But, on the other hand, we could, on no Account, and in no Seaſon or Condition of Life, be without the Peaſant and the Artiſan. Theſe People may be conſidered as the Soul and Sinews of the Community, and the Support of our Life. 'Tis from them we are conſtantly deriving ſome Accommodation for our Wants. Our Houſes, our Habits, our Furniture, and our Suſtenance, riſe out of their Labours. Now, what would become of your Vine-dreſſers, Gardeners, Maſons, and the Generality of Country People, that is to ſay, two thirds of all Mankind, if they were deſtitute of either Men or Horſes to convey the Commodities and Materials they employ and manufacture? The Aſs is perpetually at their Service: He carries Fruits, Herbs, Coals, Wood, Bricks, Tiles, Plaiſter, Lime, and Straw. The moſt abject Offices are his ordinary Lot, and 'tis a ſingular Advantage to this Multitude of Workmen, as well as ourſelves, to find a gentle, ſtrong and indefatigable Animal; who, without either Expence or Pride, repleniſhes our Cities and Villages with all Sorts of Commodities. A ſhort Compariſon will compleat the Illuſtration of the Uſefulneſs of his Services, and, in ſome meaſure, raiſe them out of their Obſcurity.

The Horſe very much reſembles thoſe Nations who are fond of Glitter and Hurry; who are perpetually ſinging and dancing, and extremely ſtudious to ſet off their Exterior, and mix Gaity in all their Actions. They are admirable, in ſome diſtinguiſhed and deciſive Occaſions; but their Fire frequently degenerates into Romantic Enthuſiaſm: They fall into wild Tranſports; they exhauſt themſelves, and loſe the moſt favourable Conjunctures, for want of Management and Moderation.

The Aſs, on the contrary, reſembles thoſe People who are naturally heavy and pacific, whoſe Underſtanding and Capacity are limited to Huſbandry, or Commerce, and who proceed in the ſame Track without Diſcompoſure, and compleat, with a ſerious and poſitive Air, whatever they have once undertaken.

Counteſs. Would not one be tempted to think the *Prior's* Obſervations true in every Particular?

Count. There is certainly ſomething more than Raillery in what we have heard; but at the ſame time it is inſupportable, and contrary to all Decency, to make an Academic Oration in honour of ſuch an Animal: 'Tis degrading us who are the Audience; and, if I am ſeconded, it will be declared by the Majority of Voices, that the *Prior* has not furniſhed his Contingent, and muſt therefore be obliged to make us amends for the Deficiency.

Chevalier. The *Prior* is in a fair way of making another Oration: I don't ſentence him to begin again, but I confeſs I heartily deſire it.

Counteſs. And for my Part, I join my Authority as Preſident, to the Opinion of the Company, and declare, that the *Prior* ought to furniſh us with a more popular Encomium; and if the Gentleman ſhould not think it proper to chuſe his Subject among the Domeſtic Animals let him have Recourſe to thoſe that are ſavage.

Prior. Thoſe who make Laws, have a Privilege to interpret them: May I therefore be permitted to take ſome foreign Animal?

Counteſs. You may command the four Parts of the World: But pray favour me a Moment: Can you give us a Deſcription of that Animal who is ſuch an excellent Architect? I muſt beg you to aſſiſt my Memory, for I cannot recollect his Name.

The Field-Mouſe.

Prior. I don't know any Animal who builds a more commodious Habitation, under Ground, than the Field-Mouſe, who ſcoops out ſeveral ſubterranean Cells, that have a free Communication with one another; in ſome of theſe the Creature ſtores his Proviſions, which conſiſt of Fruits, according to the Seaſon, but eſpecially Nuts and Ears of Corn, which keep longer than any other Article of his Food, and are piled in Heaps. There are other Cavities, where the Family are diſpoſed on little Beds of Wool and Flew. At the Extremity of the Lodge, is a Magazine that furniſhes all the reſt with Accommodations in a very elegant Manner.

Counteſs. It is good to know theſe Particulars; but this is not the Animal I meant.

Prior. Perhaps your Ladyſhip means the Porcupine, or elſe the Hedghog, who have alſo their Magazines. There is a perfect Similitude between theſe two Species.

The Porcupine.

The Hedghog (of which we are acquainted with two Kinds, one more common, diſtinguiſh'd by the Snout of a Hog, the other leſs frequently ſeen, and form'd with the Noſe of a Dog) is a ſmall Animal, intirely covered with Prickles an Inch and an half in Length; and very like thoſe which ſhoot from the Shells of Cheſnuts. When he is attacked, he bends his Head and Paws under him, rounds himſelf into a Ball, and erects his pointed Quills, in ſuch a Manner, that Dogs and other Animals are compelled to leave him.

The Porcupine is a much larger Creature, and his Length ſometimes exceeds two Feet. He is ſhagged all over, with hard and ſharp Hairs, of unequal Length; from two or three, to twelve Inches and more: Theſe are ſhaped like the Stalks of Corn, with Intermixtures of black and white; they likewiſe ſwell towards the Middle, and terminate in a Point with two ſharp Sides. This Animal preſents his Side to his Enemy, erects all his Darts with a menacing Air, and ſometimes plunges them ſo deep, in the Fleſh of the Creature by whom he is aſſaulted, that ſeveral of them remain in the Wounds, and are detached from his Body when he retires. The Sockets of theſe are afterwards filled by others, which are enlarged by Time.

The Hedghog makes another Uſe of his commodious Darts, for he rolls himſelf over Apples, Grapes, and all other Fruits he can find under the Trees, and carries them off on his ſharp Quills, in the beſt Manner he can. He eats what takes up moſt Room in his Cell, or is apt ſooneſt to decay, and endeavours to have a Reſerve of Nuts for the latter Seaſon; but paſſes the Severity of the Winter in Sleep.

Counteſs. This Animal has likewiſe its Merit; but I am thinking of another, that my Merchant of *St. Malo* entertained us ſo agreeably with the other Day.

Prior. Her Ladyſhip means the Beaver.

Counteſs. The very ſame.

Prior. But the Deſcription of this Creature, Madam, will be infinitely more agreeable from you than me.

Counteſs. Very well indeed. What Sort of Conſcience, Sir, do you act by? You firſt contract a Debt, and then deſire another to diſcharge it.

Prior. Compliance, I find, is abſolutely neceſſary. To the Point then. We may conſider, in the Beaver, the Uſe made of his Skin, and the Dexterity with which he builds his Habitation.

The Beaver.

This * Creature is about four Foot in Length, and twelve or fifteen Inches broad. His Skin, in the Northern Regions, is generally black, but it brightens into a reddiſh Tincture in the temperate Climates. He is covered with two Sorts of Hair, one long, and the other a ſoft Down; the latter, which is an Inch in length, is extremely fine and compact, and accommodates the Animal with a neceſſary Warmth. The long Hair preſerves the Down from Dirt and Humidity.

The Beaver, whether Male or Female, has four Bags, under his Inteſtines, impregnated with a reſinous and liquid Subſtance, which, when it is ejected, ſettles into a thick Conſiſtence. We ſhall preſently ſee to what Purpoſe the Creature employs it. Phyſicians call it *Caſtoreum*, and preſcribe it as an excellent Remedy againſt Poiſons, Vapours, and other Indiſpoſitions; but when it grows old, it blackens and degenerates into a dangerous Poiſon.

They ſtrip the long Hair from the Beaver's Skin, and manufacture the Down into Stockings, Caps and Stuffs; but theſe have been found liable to harden like Felt, and are therefore diſuſed in ſeveral Places, ſo that at preſent the Beaver is uſed for little elſe than Hats or Furs. There is one Circumſtance, which you may be apt to thing incredible, though the Fact be certain; what I mean is this; the Beavers Skins are moſt valuable, when the wild Natives of the Country have lain upon them a conſidera-

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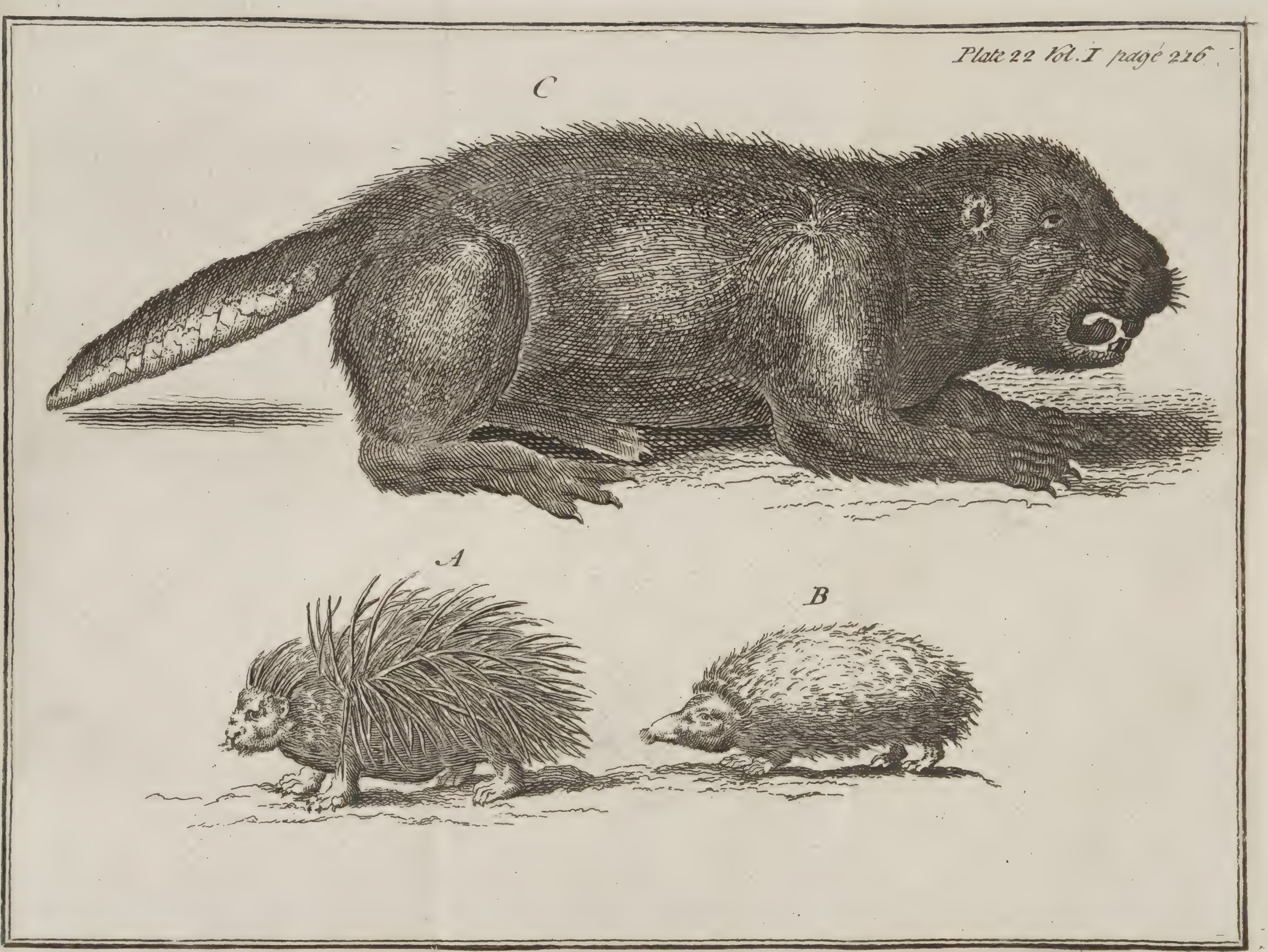
* Memoir de l'Academ. des Scienc. 1704. Lettre de Mr. Sarrazen Medecin. du Roi envoie au Canada. Voyage du Baron de la Honton. Memoires pour l'hiſtoire des Animaux, de l'Imprimerie Royale.



A. The Porcupine. B. The Hedghog. C. The Beaver.

A. Motte sculp.

ble Time; for, by theſe Means, the long Hair falls off, and the Down becomes compact and moiſt by Tranſpiration, and conſequently fitted to be manufactured. But I perceive the *Chevalier* will grow impatient, if I don't ſhew him the Beaver's Dwelling.

Chevalier. Will you begin, Sir, as you did with Bees, and inform me what Implements this Creature is furniſhed with for Building?

Prior. He has three, his Teeth, his Paws, and his Tail: His Teeth are ſtrong, and deeply rivetted into his Jaws, with a long and crooked Root: With theſe he cuts, as well the Wood with which he builds, as that which furniſhes him with his Food. His Fore-feet reſemble thoſe of ſuch Animals as hold what they eat in their Paws, as Apes, for Inſtance, and Rats and Squirrels; with theſe Feet he digs, ſoftens and works the Clay, which is extremely ſerviceable to him. His Hind-feet are accommodated with Membranes, or large Skins, extending between his Toes like thoſe of Ducks, and all other Water-Fowl: This makes it evident, that the Author of Nature intended the Creature ſhould be amphibious. His Tail is long, a little flat, intirely covered with Scales, ſupplied with Muſcles, and perpetually lubricated with Oil or Fat: This Animal, who is an Architect from his Nativity, uſes his Tail inſtead of a Hod, for the Conveyance of his Clay or Mortar, and a Trowel to ſpread and form it into an Incruſtation: The Scales prevent theſe Materials from penetrating the Tail with their Coldneſs and Humidity. But the Scales, as well as the Tail, would be injured by the Air and Water, were it not for the Prevention of an Oil, which he diſtributes all over them with his Snout; and the Bags I have already mentioned, are undoubtedly the Magazines of this Fluid.

The Beavers inhabit the ſame Manſion in great Numbers, unleſs violent Heats or Inundations, the Purſuits of Hunters, Scarcity of Proviſions, or the extraordinary Increaſe of their Offspring, oblige them to ſeparate. In order to raiſe themſelves a convenient Abode, they chuſe a Situation that abounds with Suſtenance, and is waſhed by a Rivulet, and where they may form a convenient Reſervoir of Water for their Bagnio. They begin with Building a Mole or Cauſey, in which the Water may riſe to a Level with the firſt Story of their Habitation.

Chevalier. The firſt Story! Have they a firſt and a ſecond like ours?

Prior. Exactly the ſame. But let us firſt examine the Cauſey, which forms their watering Place, and ſerves to raiſe the Water to a ſufficient Height. This Cauſey, at the Foundation, may contain ten or a dozen Feet in Thickneſs: It deſcends in a Slope, on the Side next the Water, which, in Proportion to its Elevation, gravitates upon the Work, and preſſes it with a ſtrong Tendency towards the Earth. The oppoſite Side is raiſed perpendicular like our Walls, and the Slope, which, at its Baſis, is twelve Feet broad, diminiſhes towards the Top, whoſe Breadth does not exceed two Feet: The Materials of this Work are Wood and Clay. The Beavers, with an admirable Facility, cut the Pieces of Wood, ſome as thick as one's Arm, others as large as one's Thigh, and from two to four, five, or ſix Feet in Length, and ſometimes more, in Proportion to the Aſcent of the Slope. They drive the Extremity of theſe very near each other, into the Earth, and take Care to interlace them with other Stakes, more ſlender and ſupple. But as the Water, without ſome other Prevention, would glide through the Cavities, and leave the Reſervoir dry, they have Recourſe to a Clay, which they perfectly know how to procure, and with which they cloſe up all the Interſtices both within and without, and this intirely prevents all Evacuation. They continue to raiſe the Dike, proportionable to the Water's Elevation and Plenty. They are likewiſe very ſenſible, that their Materials are not ſo eaſily tranſported by Land as by Water, and therefore take the Opportunity of its Increaſe, to ſwim, with Mortar placed on their Tail, and Stakes of Wood between their Teeth, to every Place where they have Occaſion for theſe Materials. If the Violence of the Water, or the Footſteps of Hunters who paſs over their Work, damage it in any Degree, they immediately repair the Fracture, viſit all the Edifice, and, with indefatigable Application, refit and adjuſt whatever happens to be diſconcerted. But when they are too frequently perſecuted by the Hunters, they only work in the Night, or elſe diſcontinue their Labours.

When the Cauſey or Dike is completed, they begin to form their Cells, which are round or oval Apartments, divided into three Partitions, raiſed one above another. The firſt is ſunk below the Level of the Dike, and generally full of Water; the other two are formed above it. They raiſe this Structure, in a very ſolid Manner, on the Edge of their Cauſey, and always in Stories, that, in caſe the Water ſhould aſcend, they may dwell in an higher Situation. If they find any little Iſland near the Reſervoir, they fix their Dwelling there, which is then more ſolid, and they are leſs incommoded with the Water, in which they are capable of continuing but a ſhort Time: But if they are not favoured with this Advantage, they drive Stakes into the Earth with their Teeth, to fortify the Building againſt the Winds and Water. At the Bottom they ſtrike out two Openings to the Stream, one conducts them to the Place where they bathe, and which they always keep very decent, the other is a Paſſage to that Quarter, where they carry out every Thing that would ſoil or rot the upper Apartments. There is a third Aperture much higher, calculated to prevent their being ſhut up, when the Ice has cloſed the Openings into the lower Lodgments. They ſometimes build their Houſe intirely on the dry Land, and ſink Ditches five or ſix Feet deep, in order to deſcend to the Water. They employ the ſame Materials and Induſtry in the Structure of their Dwelling, as they uſe for the Cauſey. The Walls of the building are perpendicular, and two Feet thick. As their Teeth are more ſerviceable than Saws, they cut off all the Projections from the Wood that ſhoots out beyond the Perpendicular of the Wall; after which they work up a Mixture of Clay and dry Graſs, into a kind of Mortar, with which, by the Aid of their Tails, they rough-caſt the Out and Inſides of the Work.

The Edifice is vaulted within, like the Handle of a Baſket, and generally riſes in an oval Figure. The Dimenſions are proportioned to the Number of the intended Inhabitants. Twelve Feet in Length, and ten in Breadth, are ſufficient for eight or ten Beavers. If the Number increaſes, they enlarge the Place accordingly. It has been aſſerted for a Truth, that there have been found above four hundred of theſe Creatures, in different Lodgments communicating with one another. But theſe popular Societies are very rare, becauſe they are too unmanageable and tumultuous, and the Beavers are generally better acquainted with their own Intereſts. They aſſociate to the Number of ten or a dozen, and ſometimes a few more: They are a Set of amicable and ſagacious Inhabitants, in whoſe mutual Society they may propoſe to paſs the Winter together, in a very agreeable Manner. They are gifted with a natural Arithmetic, which enables them to proportion the Place and Proviſions to the Neceſſities of the Company; and as it is cuſtomary for every Individual to continue in the conſtant Poſſeſſion of his own Cell, they never charge themſelves with unneceſſary Expences for any accidental Gueſts.

There are ſome Beavers called Terriers, who make their Abode in Caverns dug in a riſing Ground, either on the Shore or at ſome Diſtance from the Water, to which they ſcoop out ſubterranean Trenches from their Cavern, which deſcend from ten to an hundred Feet in Depth. Theſe Trenches furniſh them with Retreats, ſituated at unequal Heights, and wherein they enjoy a Shelter from the Water when it aſcends. Their Beds are made of Chips, which ſerve them inſtead of a Quilt, and of Graſs, which accommodates them in the Nature of a Feather-Bed.

All theſe Works, eſpecially in the cold Regions, are compleated in *Auguſt* or *September*, after which Period they furniſh themſelves with Proviſions. During the Summer Seaſon, they regale themſelves with all the Fruits and Plants the Country produces. In the Winter, they eat the Wood of the Aſh, the Plane, and other Trees, which they ſteep in Water, in Quantities proportionable to their neceſſary Conſumption; and they are ſupplied with a double Stomach, to facilitate the Digeſtion of ſuch a ſolid Food, at two Operations. They cut Twigs, from three to ſix Feet in Length; the large ones are conveyed, by ſeveral Beavers, to the Magazine, and the ſmaller by a ſingle Animal; but they take different Ways. Each Individual has his Walk aſſigned him to prevent the Labourers from being interrupted by their mutual Occaſions.

The Dimenſions of their Pile of Timber are regulated in proportion to the number of the Inhabitants; and it has been obſerved, that the Proviſion of Wood for ten Beavers, comprehended thirty Feet in a ſquare Surface and ten in Thickneſs. Theſe Parcels of Wood are not piled up in one continued Heap, but laid croſs one another, with Interſtices between them, that they may the better draw out what Quantity they want, and always take the Parcel at the Bottom, which lyes in the Water. They cut this Wood into ſmall Particles, and convey it to their Cell, where the whole Family come to receive their particular Share. Sometimes they expatiate in the Woods, and regale their Young with a new Collation. The Hunters, who are ſenſible theſe Creatures love green Wood better than old, place a Parcel of the former about their Lodge, and then have ſeveral Devices to enſnare them. When the Winter grows ſevere, they ſometimes break the Ice, and when the Beavers come to the Opening, for the Benefit of freſh Air, they kill them with Hatchets; or make a large Aperture in the Ice, and cover it with a very ſtrong Net, and then overturn the Lodge; upon which the Beavers, who think to eſcape in their uſual way, by flying to the Water, and emerging at the Hole in the Ice, fall into the Snare, and are taken.

Chevalier. 'Tis pity to overturn the Tenement of theſe poor Beaſts; one can no where elſe diſcover ſuch remarkable Induſtry.

Count. Travellers aſcribe almoſt the ſame Inclinations and Labours to the Civet Cat, who is an Animal peculiar to *America*, and larger than our Houſe Cats. This Creature, in every Particular, is a Beaver in Miniature, and therefore it would be needleſs to make him the Subject of any further Diſcourſe.

The Civet Cat.

Conteſs. Chevalier, do you take notice of what they are doing on the Bank of the Mote? 'Tis an Affair wherein you have ſome Concern.

Chevalier. Where are thoſe Perſons going with their Poles and Nets? 'Tis certainly a Party of Fiſhing, which her Ladyſhip has an Inclination to entertain me with:

I hope theſe Gentlemen will favour us with their Company.

Count. We are inſeparable from the *Chevalier*, and eſteem his Pleaſures our own.

Prior. You know, my dear *Chevalier*, that I am a Fiſher of Men: I hope your Employment will be agreeable to you, but you muſt permit me to have ſome Regard to mine.

The End of the twelfth DIALOGUE.

FISHES.

DIALOGUE XIII.

The COUNT *and* COUNTESS.
The PRIOR, *and*
The CHEVALIER.

Counteſs. CHevalier, we are come to break in upon your agreeable Meditations. I obſerved you lying above an Hour on the Turf that borders this Baſon: May one know what engaged ſo much of your Attention?

Chevalier. I have been making a Viſit to the Perch and Carp I reſerved out of our Yeſterday's Fiſhing, and reſtored to Liberty in this Water: I threw ſome Bread to them, which they devoured with great Eagerneſs: I have obſerved all their Motions, which amuſed me with ſeveral Thoughts on the Nature of Fiſhes, and I have a number of Queſtions to propoſe to theſe Gentlemen. In the firſt Place, I am unable to comprehend, why the Water, that ſtifles all other Animals, ſhould be no way injurious to theſe. I ſhould likewiſe be glad to know what particular Food they ſubſiſt on; and how they are able, without Feet, Arms, Talons, Trunk or Sting, to advance and ſeize their Prey.

Counteſs. If your Meditations, *Chevalier*, always produce ſuch reaſonable Queſtions, indulge them frequently, and you will make great Diſcoveries. Every Particular you have mentioned has employed my Thoughts, and I ſhould be glad to hear the Anſwers theſe Gentlemen are preparing.

Prior. I can give your Ladyſhip ſome Satisfaction, with reſpect to the Element and Food of Fiſhes, but it requires a more delicate Philoſophy than mine, to account for their progreſſive Motions, and Manner of Swimming: This muſt therefore be his Lordſhip's Province.

I am going to reſume the Contemplations of our amiable Philoſopher. I ſtand on the Edge of the great Baſon, and fancy myſelf the *Chevalier*, engaged in the following Train of Thought. I have conſtantly beheld all Nature repleniſhed with Inhabitants. The Air is peopled with a hundred Claſſes of Animals; others expatiate in the Fields, and creep on the Surface of the Earth. There are Families in the deep Receſſes of Woods, the Hearts of Leaves, and under the Bark of Trees. The very Bowels of the Earth are hollowed and inhabitated: But all theſe Creatures, ſo different from each other in their Nature and Manner of Life, have one Circumſtance in common among them, they breathe the fluid Air: But we are now conſidering another Element, in which they all die when they are plunged in it. Is it then impoſſible to live in the Water? And is that Element, which covers more than half the Globe, deſtitute of Inhabitants? Quite the contrary, I there diſcover a Variety of Tribes; and as the Animals who live on the Earth die in the Water, ſo I obſerve the Inhabitants of the Waves periſh in the Air, and are incapable of living out of the Element to which they are conſigned: But, notwithſtanding all this, I find it difficult to comprehend in what manner their Blood, for with ſuch they are furniſhed, is capable of Circulation, and why it is not coagulated and condenſed by the extraordinary Chillneſs of the Waters. The terreſtrial Animals are accommodated, either with Feathers, or a delicate Down, or cloathed with good Furs, garniſhed with Hair, to defend them from the Impreſſions of the Air, which is ſometimes exceſſively cold; but I am not able to diſcover the leaſt Similitude, in any of theſe Circumſtances, among Fiſh. What are they ſupplied with to qualify them for

The Cloathing of Fiſh.

The Glew.

The Scales and Lard.

for reſiſting an Element much colder than the Air? Let us recollect what we have ſometimes obſerved, either in handling or opening a Fiſh: The firſt Thing that offers itſelf to the Touch is a certain Glew, that moiſtens all the Surface of the Animal's Body. In the next Place, I obſerve a Covering compoſed of ſtrong Scales; and, before I come to the Fleſh of the Creature, diſcover a kind of Lard or oily Subſtance, extending from one Extremity to the other, and encompaſſing the whole. I can neither comprehend, how theſe Scales receive their Formation, Growth, and Supplies, nor what is the Origin and Reſervoir of this Oil: But theſe Scales by their Solidity, and this Oil by its Antipathy to the Water, ſupply the Fiſh both with Warmth and Life, and he could not be accommodated with a Robe more light and impenetrable; ſo that where-ever I direct my View, I perceive a Wiſdom perpetually fertile in new Deſigns; perfectly acquainted with every Circumſtance of its Work, and never contradicted or embarraſſed by the Diſobedience of the Materials it employs.

Chevalier. I begin to find I meditate very well. I am pleaſed to hear myſelf, and think it adviſeable to continue.

Prior. Let us do ſo. But, inſtead of the Baſon's Edge, let us imagine we had the Shore of the Ocean in Proſpect. Let us take our Station on an Eminence, from whence our View may be extended in full Liberty over this immenſe Baſon, which was hollowed by the Hand of the Almighty. The Salt Waters which it contains, ſeem to have a manifeſt Sterility, or, if they give Life to ſome particular Animals, their Fleſh will be improper for our Nouriſhment. But I find myſelf miſtaken, and God has not conſtituted Man the Lord of the Fiſhes of the Sea, as well as of other Animals, in vain: I even obſerve a Multitude of Fiſher-boats, ſailing from all the neighbouring Shores, to collect the Bounties of the Sea, and which furniſh us with a Nouriſhment equally diverſified and delicate. Here my Aſtoniſhment redoubles. Navigators have made ſeveral Attempts to render the Water of the Ocean ſerviceable to them in long Voyages, and, according to ſome Accounts, have ſucceeded to a certain Degree, but this Water could never be made fit to be drank. The Sea waſhes from the Lands it laves, a Vitriol and Bitumen, which being like itſelf, in a perpetual Agitation, diſperſe and inſinuate themſelves into the ſmalleſt Particles of the Water, in ſo intimate a Manner, that neither Filtrations, nor the Power of the Still, nor any other Methods have been able to purify it from its Brackiſhneſs. And yet it is in this Water, whoſe Taſte is ſo diſpleaſing and inſupportable, that God nouriſhes and brings to Perfection, the Fleſh of thoſe Fiſh, which the Voluptuous prefer to the moſt exquiſite Fowls. Theſe are Things which ſeem to be impoſſible, and yet are not to be conteſted. I am ſenſible, at every Step I take, that God obliges me to believe certain Doctrines in Nature, as well as Religion, of which he has not thought fit to impart to me an adequate Comprehenſion; and having judged it ſufficient to diſcloſe me, the Exiſtence and Reality of the Wonders produced by his Power, he requires me to ſacrifice my Reaſon to the Nature of his Works, and the Manner in which he effects them.

Let us continue to coaſt along the Shore, and approach one of theſe Fiſhers, to ſee what has been caught. In an Element which produces nothing, one would not imagine, either the Number or Fecundity of the Inhabitants to be very conſiderable. All that I behold ſurpaſſes my Capacity, and my Reaſon is ſtill contradicted by Experience. I obſerve a Set of Fiſhermen, who

Shell-Fiſh.

contrary to my Expectation, have taken an infinite Number of Muſcles, Crabs, Lobſters, and other Fiſh of a monſtrous Size: I diſcover Piles of Oyſters, whoſe Whiteneſs and Fat excite my Appetite. I perceive other Fiſhermen who empty

Flat Fiſh.

their Nets, and obligingly preſent us with a Profuſion of Turbots, Flounders, Dabs, Burts, Plaice, and all the Species of Flat Fiſh, whoſe Fleſh is ſo exceedingly eſteemed. In another View, I take Notice of a whole Fleet of Ships loaded with Herring, and this is now the Seaſon for that Fiſhery. * At other Times, inſtead of Herrings, there are Shoals either of

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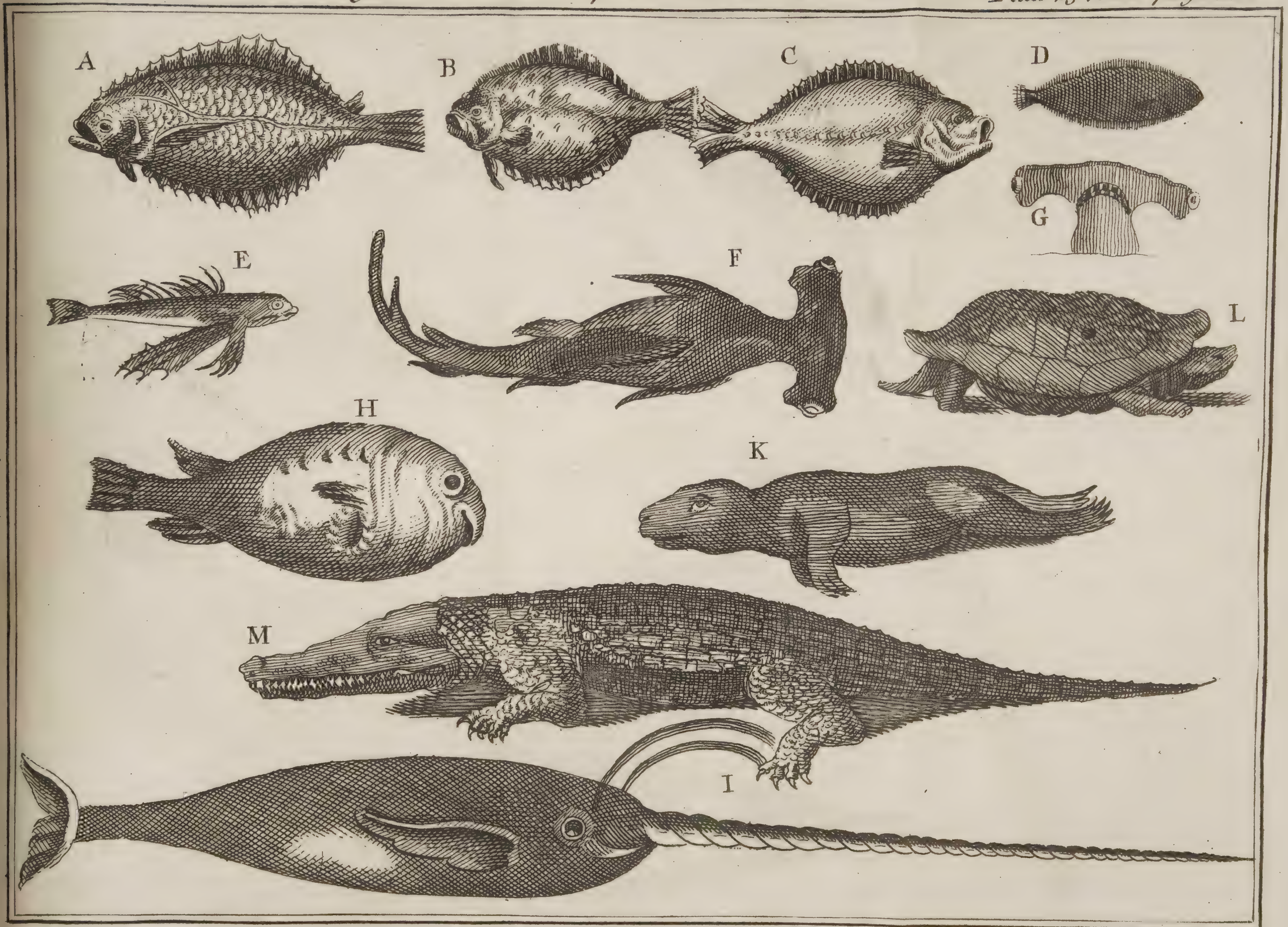
* Ruiſch. Theatr. Anim. Tom. I.

Fiſhes and Amphibious Animals.

Plate 23 Vol. I page 226



Toms ſculp.

A. *A Dab.* B. *A Turbot.* C. *A Flounder.* D. *A Sole.* E. *A Flying Fiſh.* F. *The Zygæna, or Libella.* G. *The head of the Libella, view'd below, & with yᵉ Throat open.* H. *The Porpoiſe.* I. *The Narval or Sea Unicorn.* K. *The Sea Calf.* L. *The Tortoiſe.* M. *The Crocodile.*

Mackerel or Whitings, who voluntarily preſent themſelves on the Coaſts, with which whole Provinces are furniſhed, by the Capture of a ſingle Day. It ſhould ſeem as if the Sea were incapable of containing the Treaſures with which it teems. Legions of Smelts and Flounders quit the Sea in the Spring of the Year, and ſwim up the Rivers; Shads follow the ſame Track, and improve their Fleſh to its due Perfection in the freſh Water; Salmons continue to the Month of *July*, and later, to inrich the Fiſhermen, ſixty and even eighty Leagues from the Sea. Every Seaſon regales us with new Pleaſures; without interrupting the ordinary Preſents they make us of * Lampreys, Smelts, Tunnies, Goldfiſh, Rockets, Soles, Thornbacks, and ſuch a Variety of others that garniſh our Tables, and pleaſe every Palate. What a Delicacy and Profuſion do we receive from the Liberality of this Element! But this very Delicacy might render them attainable by none but the Rich; or the Abundance might be ſo extraordinary, that the Corruption of the Whole, or the greateſt Part, might prevent their Conſumption by Man: Both theſe Incoveniencies are remedied by a little Salt. I ſee all our Fiſhermen employed in barrelling up their Herrings, after they have been ſalted. In the high Seas already appear the Veſſels that bring us from *Newfoundland*, that is to ſay, from a Diſtance of near a thouſand Leagues from hence, an incredible Number of Codfiſh preſerved by this Precaution: In this manner the Sea loads us with its Bounties, and at the ſame Time, ſupplies us with Salt that facilitates their Communication, and ſecures their Conveyance: By which means, the Poor, who live at the remoteſt Diſtance from the Ocean, are alſo made Partakers of its Favours at a ſmall Expence. I have no Expreſſions that can riſe to any Equality with my Admiration and Gratitude. In this Prodigality of the Sea, I likewiſe diſcover a Precaution that enhances the Value of its Gifts, and proves a new Benediction to us. Thoſe Fiſh who are wholeſome and palatable, are extremely prolific, but thoſe whoſe Fleſh is diſagreeable and

Smelts.

Shads.

Herrings.

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* Bellon. de Aquatil.

pernicious, and whoſe enormous Size renders them formidable to others, are commonly viviparous; that is to ſay they bring their Young compleatly formed into the World, and have ſeldom more than one or two at a Birth: Of this Claſs are the Whale, the Dolphin, the Porpoiſe, and the Sea-Calf. The ſame Wiſdom which has ſo advantageouſly regulated the Bounds of their Fecundity, removes far from our Shores thoſe whom we have no Occaſion for, and brings to our Nets all the Species moſt beneficial to us.

Whales, Porpoiſes, and all the great Fiſh whoſe Appearance would alarm and put to Flight thoſe who nouriſh us, ſeek the high Seas, for fear of being driven on the Coaſts, where they would be deſtitute of a ſufficient Body of Water to ſuſtain them. An inviſible Hand impels them to thoſe Parts that are abandoned by the reſt, and prepares for them a Nouriſhment hitherto unknown, amidſt the Ice of the North, and the Seas that waſh the Coaſts of *Greenland*; or it drives them to thoſe Parts, in order to ſupport the miſerable Inhabitants, whom it would not totally neglect: Theſe People eat the Fleſh, and drink the melted Fat; and likewiſe employ the Bones and Skin in building, as well as the lining the Boats in which they fiſh.

All the other Species, on the contrary, come in Shoals to our Coaſts, ſome are always with us, others ſwim yearly to us in vaſt Multitudes; the Time of their Paſſage, and their particular Track, are well known; and very ſingular Advantages are derived from that Knowledge. Let us form a Judgment of other Fiſh of Paſſage, by Herrings and Cod. The Nation of Herrings ſeem to have their Capital between the Points of *Scotland*, *Norway*, and *Denmark*. From that Situation, the *Daniſh* Colonies take their Progreſs every Year, and traverſe at different Times, the Chanel, and after they have paſſed by *Holland* and *Flanders*, viſit our *Neuſtria*. But however, theſe are not a Troop of *Banditti*, who coaſt about at random: Their Tour is preſcribed, and their March yearly regulated, with the utmoſt Exactneſs. The whole Body begin their Departure at the ſame Time: None are permitted to ſtraggle out of their proper Track; none among them

Fiſh of Paſſage.

deſert or commit Depredations: They continue their Progreſs from Coaſt to Coaſt, till the appointed Period: They are a numerous People, and the Voyage is long, and when the Body of the Army is paſſed, they are all gone, and none of the ſame Species make their Appearance 'till the next Year. Attempts have been made to diſcover, what induces the Herrings to undertake ſuch a Voyage, and inſpires them with the Policy they obſerve. Our Fiſhermen, as well as thoſe of *Holland*, have obſerved, that the Chanel every Year teems with an innumerable Multitude of Worms and little Fiſh, on which the Herrings feed. They * are a kind of *Manna*, which theſe Creatures come punctually to gather up; and when they have intirely clear'd the Seas, in the Northern Parts of *Europe*, during the Summer and Autumn, they deſcend towards the South, where they are invited by a new Stock of Proviſions; but if theſe fail, they proceed to accommodate themſelves elſewhere; their Paſſage is more expeditious, but the Fiſhery leſs valuable.

Our Seas are but little frequented by Cod-fiſh; whoſe great Rendezvous is at the vaſt Bank before *New-foundland*: There they keep their Feſtivals, and are ſo prodigiouſly numerous, that the Fiſhermen, who aſſemble there from all Nations, are employed from Morning to Night, in nothing but caſting the Line, drawing up and embowelling the Fiſh, and fixing their Entrails on Hooks, to enſnare others. † One Man ſometimes catches three or four hundred in a Day. When the Suſtenance that allures them is exhauſted in thoſe Parts, they diſperſe and proclaim War againſt the Whitings, which they are extremely fond of: ‡ Theſe fly before them, and we owe the frequent Returns of theſe Fiſh on our Coaſts, to the Chace given them by the Cod fiſh.

The Wars of Fiſhes.

Now I have mentioned their Wars I recollect what has been told me of that which reigns through all the Species: The Sole, and moſt flat Fiſh conceal themſelves in the Mud, whoſe Colour their Backs very much reſemble, and are attentive in obſerving where the Females of the large Fiſh dig Holes for their Spawn; on which the Males afterwards depoſite their impregnating Fluid, in order to render that Spawn prolific: The Sole immediately ſprings from her Ambuſcade, and ſolaces herſelf with this exquiſite Food, which contributes to fatten her, and gives her an admirable Flavour. The ſmall Soles in their Turn, afford a Nouriſhment to the large Crabs; and as ſuch kinds of Shell-fiſh ſeldom forſake the Gravel, where they ſearch for the Spawn of Fiſh, there are ſcarce any Species of them, but what are ſuſtained by this Sort of Food, and one can hardly open any of them, without finding one or two little Soles. You may judge of the other Species by this. I even ſuſpect, that the minute Crabs that are found intire in the Generality of Muſcles, and likewiſe the little Soles that are diſcovered in the Gills of ſome other Fiſh, are conſcious of their extream Smalneſs, and are therefore ſollicitous to ſecure themſelves a Shelter, in that Situation, from the Teeth of voracious Fiſhes.

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* Leeuwenhoek Op. Phyſ. 42.

† Savari Dic. de Comm.

‡ Leeuwenhoek, ibid.

Their Generation.

All the Tribes of Animals who breed in the Water, from the largeſt to the leaſt, are perpetually in Action, and at War; it is a conſtant Scene of Stratagems, Flights, Evaſions, and Violence; they mutually plunder and devour one another, without Remorſe or Moderation; in a Word, the Conduct of Fiſh reſembles that of Mankind, and I am ſurpriſed that no one has been tempted to allow them the Faculty of Reaſon; but a more ſerious Thought occurs to me. If the Inhabitants of the Water are always upon the Watch, to make mutual Depredations on the ſcatter'd Spawn, and devour one another, this Element would in Time ceaſe to be repleniſhed, and indeed, had long ago been intirely depopulated; as the ſmalleſt Fiſh are a Prey to the ſtronger, thoſe muſt have been all deſtroyed, and theſe in their Turn, would have periſhed for Want of Suſtenance, but nothing can be more frivolous than the Criticiſms made by Man on the Works of God; he has provided for the Preſervation of Fiſh, by giving Strength to ſome, and to others Activity and Circumſpection; and by multiplying them to ſuch an aſtoniſhing Degree, that their Fecundity exceeds their natural Impatience to devour

their Fecundity.

one another*; and thoſe who are deſtroyed, are infinitely leſs numerous than the Survivors who recruit the Species. As great as the Number of Cods may be, that have been conſumed by Man this Year, or devoured by other Fiſh, what remains of that Tribe, is always more than ſufficient to furniſh us with the ſame Quantity, a Year or two hence. And this is the Demonſtration: When I went to view the Port of *Dieppe*, they brought us a very fine Cod, but much inferior to thoſe we receive from the great Bank; I was curious to count the Eggs ſhe contained; in order to which, I took as many as weigh'd a Dram, and three of us engaged to number them; we agreed pretty well in our Account, and then writ down the Total of the whole Dram; after which, we weighed all the Maſs of Eggs, and repeated eight times the Sum of one Dram for every Ounce, which contains eight Drams†. The Addition of all theſe Sums, produced a Total of nine millions, three hundred forty-four thouſand Eggs.

Ounteſs. I don't pretend to compute after the *Prior*, and have no Difficulty to believe what he ſays, as incredible as it may at firſt appear. A common Carp is far from having ſuch a Number of Eggs as a large Cod; but for all that, the Quantity is ſo amazing, even at the firſt Glance, that it contributes very much to juſtify your Calculation. All you have related aſtoniſhes me extremely, and gives me likewiſe an Inclination to meditate, or in other Words, to reaſon. When we are curious to know what may be the End or Intention of this prodigious Fruitfulneſs, 'tis certainly not to ſtock the Rivers and Sea, with as many Fiſhes as there are Eggs, for if it was, I am apt to think the Baſon of the Ocean itſelf would not be ſufficient to contain them. But we ſee there is a double View in this Fertility; one, to preſerve the Species, midſt all Accidents that may happen, and the other, to accommodate the Fiſh with a plentiful and juicy Food.

The Intention of this Fecundity.

Chevalier. At preſent, I ſee, in ſome meaſure, how Fiſhes are enabled to live in the Water, and preſerve their Species. I there diſcover Shell-fiſh, Worms, Eggs,

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[*] Explic. de l'ouvrage de ſix Jours.

[†] Leeuwenhoek, Ep. Phyſ. 20.

Roes, and ſmall Fry, in ſuch an extraordinary Abundance, that I am no longer in pain for the Accommodations of the Table. The Inhabitants of the Water have a ſure Allowance; but their Food conceals itſelf, and flies from them; and I diſcover nothing in Fiſhes, beſides a Head, a large immoveable Body, and a Tail. How are they able, with ſo few Organs, to advance, ſwim, and launch on their Prey? There is likewiſe another Circumſtance, in which I am entirely loſt. Before I threw my laſt Carp into the Water, I took a Pair of Sciſſars and cut his Fins, upon which I imagined he would be uncapable of ſwimming any more; and yet the Fiſh ſhot away, and darted up and down; but was always turned, either on one of his Sides, or with his Back downwards, whereas all the others ſwim on their Belly.

Counteſs. The poor *Chevalier* will have no Sleep to-night, if theſe Difficulties be not cleared up.

Count. I ſhall let you know, my dear *Chevalier*, in what manner I conceive all theſe Operations practicable. The Figure of all kinds of Fiſh, as it perpetually tapers a little at the Head, qualifies them for traverſing a Fluid. The Tail, by the Aſſiſtance of its Muſcles, is extremely flexible, it is furniſhed with great Strength and Agility, inclines to the Right and Left, and, as it recovers itſelf into a ſtrait Line, repels the Water behind it; after which it immediately bends to the Right and Left, and, by this alternate Impulſe, advances the Head and all the reſt of the Body, in an infinitely better manner than that by which a progreſſive Motion is communicated to a Boat, by an Oar placed at the Stern, and work'd about alternately to the Right and Left. The Fins, which are inſerted under the Belly of the Fiſh, contribute likewiſe, in ſome Degree, to repel the Water, and put the Body in Motion; they alſo cauſe it to ſtop, when they are extended by the Creature, and ceaſe to play to and fro; but their chief Function is to regulate the Motions of the Body, by poiſing it in an Equilibrium, ſo that if the Fiſh only moves the Fins on her right Side, and brings thoſe on her left cloſe to her Body, all the Motion is immediately determined to the left: Juſt as a Boat with two Oars, when

The Figure of a Fiſh.

The Tail.

The Fins.

only one of them is employ'd, will always turn to the Side to which it is impelled by the other. Deprive the Fiſh of theſe Fins, the Back, which is heavier than the Belly, being no longer kept in a due Poiſe, will ſlant on one Side, or be quite inverted; and this happens to dead Fiſh, who riſe to the Surface of the Water with their Fins uppermoſt.

Chevalier. I fancy, my Lord, I comprehend a little, how the Tail of a Fiſh, in a direct Poſition in the Water, is capable of ſtriking on one Side and the other; this is ſufficient to give the Body a progreſſive Motion. But this Tail, which has very little Thickneſs, can neither impel the Water upward or downward: And therefore I cannot ſee how the Fiſh is able either to mount or deſcend.

Count. I expected that Queſtion, and have an Anſwer prepared in this Paper. Do you know, Sir, what I now ſhew you?

Chevalier. 'Tis the Bladder of a Carp. Who has not jump'd upon it once in his Life?

The Bag of Air.

Count. The Generality of Fiſhes have one like this, or ſomething equivalent. We ſee it every Day, but give it a very equivocal Name; and indeed the Uſe of it is very different from what is commonly imagined *. This pretended Bladder is a Bag of Air, which enables the Fiſh to riſe and ſink, in proportion to its being dilated or contracted.

Nothing is eaſier to be comprehended, and a little Attention will make you Maſter of the Fact. In the firſt Place, lay it down as a certain Principle, equally agreeable to good Senſe and Experience †, that a Body ſwims on the Water, when it is not more weighty than that Quantity of the Fluid whoſe Place it poſſeſſes. If a Board, whoſe ſquare Surface contains two Feet, and its Thickneſs as many Inches, is equal in Gravity to a Body of Water of the ſame Dimenſions, it ſwims on the Superficies; and if it be but half as heavy, no more than half its Thickneſs will ſink into the Water: But ſhould this Plank be more compact and

* Borelli de Motu Animal.

† Tranſact. Phil. n. 114, 115.

weighty than a Maſs of Water of the ſame Depth and Surface, it will deſcend to the Bottom.

In the ſecond Place, the leſs Air a Body contains, and the more compact it is in its Parts, the greater is the Gravity it acquires; on the other hand, it proves lighter, in proportion to the greater Multitude of its Pores, and the larger Quantity of Air it contains. A Bottle filled with Liquor ſinks in the Water, becauſe the Liquor and the Bottle together weigh more than a Maſs of Water of the ſame Bulk; but the ſame Bottle, filled with Air, floats on the Surface, becauſe both the Air and the Bottle have leſs Gravity than the Portion of Water whoſe Place they poſſeſs. In a Word, all Bodies ſink in the Water, when they are not in an Equilibrium with the ſame Dimenſions of the Fluid in which they are immerſed.

Taking this for granted, the Body of a Fiſh, which is heavier than the Quantity of Water whoſe Place it fills, muſt always deſcend to the Bottom; and this would be the unavoidable Conſequence, if the Fiſh had not in his Entrails a Veſſel filled with Air, which enables him to ſuſtain himſelf in what Part of the Water he pleaſes: This Veſſel ſwells the Fiſh a little, and enlarges his natural Dimenſions, without making any Addition to his Weight: which is a Circumſtance that deſerves a particular Conſideration; for, by theſe means, he takes up more Space than he could poſſibly fill without the Veſſel, and this brings him to an Equilibrium with the Maſs of Water, whoſe Place he occupies. I will make a Suppoſition, that the Fiſh, without this Veſſel, weighs ſixteen Ounces, and that the Water, whoſe Place he fills, weighs no more than fifteen; the Fiſh muſt in this caſe infallibly ſink. But if you then place in the Fiſh a little Bag of Air, which makes no Addition to the Animal's Weight, but only enlarges its Body; this will then poſſeſs more Space. If the Water then, whoſe Place he takes up, ſhould weigh ſixteen Ounces, the Creature is in an Equilibrium with this Quantity of the Fluid, and will then be ſuſtained in any Part of the River where he happens to find himſelf.

Chevalier. Hitherto all goes very well. The Fiſh is in a Capacity for ſwimming, and can advance in one and the ſame Line. But your Lordſhip does not inform me, by what means he riſes and ſinks.

Count. Were he capable of enlarging his Veſſel or Bag, what would be the Conſequence? Take a little Time to conſider that Circumſtance.

Chevalier. Could he enlarge the Bag, his own Body would be larger, without any additional Weight. I comprehend that, my Lord. As he poſſeſſes the Place of a greater Maſs of Water than he did before, he muſt certainly be lighter than that Water.

Count. You have not ſaid all. If he becomes more light, he will aſcend. And, on the contrary, if the Fiſh contracts the Bag, what will be the Conſequence then?

Chevalier. He will diminiſh in Bulk, and fill up leſs Space, without loſing any Degree of his Weight; by which means he muſt be heavier than the Water whoſe Place he takes up, and will conſequently deſcend. But it ſeems improbable, my Lord, that a Fiſh ſhould be able, every Moment, to contract and dilate this Bag, according as he has Occaſion to riſe or ſink.

Count. This, however, he is obliged to do; and 'tis a Fact that has been demonſtrated by unexceptionable Obſervations.

Chevalier. How is it poſſible for the Fiſh to have the Air at his Command in the Water?

Count. The Water abounds with Particles of Air diffuſed thro' the whole Maſs. * What we commonly call the Gills of a Fiſh, are no more than a kind of Lungs, which he opens for the Reception of Air, and which have ſuch a Mechaniſm in their Structure, that this Element is admitted without any Intermixture of Water. Thro' theſe Paſſages the Air evidently flows into the Bag, and then the Fiſh aſcends: But, in order to ſink, it is only neceſſary for him to contract the Bag; the Air then riſes to the Gills, and is ejected, and the Fiſh deſcends with a Rapidity proportionable to the Quantity of evacuated Air. However, it muſt be acknowledged, that if ſeveral Facts demonſtrate that Fiſh can breathe, and receive, as well as eject, ſome Bubbles of Air; yet the Conveyance of this Air into the Bag is not a very eaſy Operation, or capable of being immediately accompliſhed; I ſhould therefore be of Opinion, that the Muſcles of the Fiſh are his uſual Expedients for contracting or enlarging the Bag; when he expands them, the Air is dilated by its natural Spring, and the Bag ſwells; when he contracts them, the Air is compreſſed, and the Bag ſhrinks.

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* Hiſt. de l'Acad. des Scienc. 1711.

Chevalier. What his Lordſhip has related ſeems to me very curious, and I am perſuaded is all juſtified by Experience. I deſign to be convinced of the Fact by an Experiment of my own, and ſhall order the Cook to prick the Bladder of one of my Carps, to let out the Air; the Fiſh will not die immediately, and I ſhall ſee if he will ſink to the Bottom.

Count. You will do very well. I love young People who are early in making Experiments and Reflections; by theſe means they form and cultivate their Judgment, and nothing is more ſure and important in philoſophic Enquiries, than ſeeing with your own Eyes. But as to your intended Experiment, I have formerly made it myſelf. You have ſeen, in my Cloſet, a Machine called an Air-pump, and which extracts the Air out of a Cryſtal, or any other Veſſel that covers it. I one Day clapped in a living Carp, and when the Air was pumped out of the Veſſel, I preſently imagined, that the other Air, which remained in the Bag of the Fiſh, would be dilated, becauſe that Element is perpetually making Efforts for its Enlargment, and there was then no external Air to gravitate on the Carp. The Affair ſucceeded to my Expectation; the Air, expanding itſelf in the Bladder, ſwelled the Fiſh to ſuch a Degree, that his Eyes ſtarted out of his Head, and the Bladder at laſt burſt in his Body: The Carp did not die, and I threw him immediately into the Water, where he continued to live a Month longer.

Chevalier. But he could not riſe any more in the Water.

Count. Very true; and therefore he crawled along the Bottom of the Pond like a Serpent *.

Counteſs. This Bag of Air really produces ſurpriſing Effects. But your Fiſh muſt certainly be great Philoſophers, to know the juſt Degree to which they ought to ſwell and contract themſelves, in proportion to their intended Elevation or Deſcent, and to be able properly to open or cloſe the

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* Borelli. ibid. Propoſ. 29. Lowthorp's Abridg. Vol. II. p. 845.

Air-vent, as well as extend their Muſcles, ſuitable to any particular Degree of Aſcenſion in the Water.

Count. Our Reaſoning muſt ſubmit to Experience. But this Difficulty is ſufficiently ſolved, by conſidering, that the Fiſh perform all theſe Operations without any Conſciouſneſs of what they do; and the Exactneſs of their Execution, inſtead of diſcovering any Knowledge or Attention of the Animal in whom they are tranſacted, only manifeſts the unſearchable Wiſdom of the Almighty Creator of all Things.

Prior. With reſpect even to ourſelves, whom God has endued with Reaſon for the Regulation of our Actions, what a Number of Functions are carried on without our Participation? We breathe, without knowing either the Structure or Uſe of the Lungs; and how many People are even ignorant they have any Lungs at all?

Count. We leap, we dance, and throw ourſelves into a Variety of Geſtures, without knowing either the Nerves we ought to extend, or the Muſcles neceſſary to be ſwelled or relaxed, in order to accompliſh ſuch Motions.

Counteſs. I am not fond of Diſputations, for I think they give one a diſagreeable Character; but let me deſire you, Gentlemen, to explain to me one thing that ſeems inconſiſtent with what you have advanced. I may ſpeak of what occurs to me every Day. Have we ever diſcovered any Bag like this in Lobſters, who live in the Water? Is any Thing of this Nature to be ſeen in Crabs and Tortoiſes, who expatiate in that Element in full Liberty? I am likewiſe of Opinion, that it is not poſſible to make this Diſcovery either in Soles or Plaice, or any other flat Fiſh.

Count. We need not look for ſuch a Bag in theſe Creatures, they have it not, and indeed it is altogether unneceſſary [*]. River Crayfiſh, Oyſters, Lobſters, and Crabs, never quit the Bottom of the Water, any more than Soles, and flat Fiſh; however, as the Weight of their Body is almoſt in an Equilibrium with that of a Maſs of Water of the ſame Magnitude, they are capable of ſwimming a little, but without the Inſtrumentality of an Air-bag. The Fact is much the ſame with reſpect to the Tortoiſe, for as ſhe enjoys the Benefit of Lungs, ſhe can diſtend herſelf by an Influx of Air, and be brought to an Equilibrium with the Water, like a Frog. She is alſo enabled to ſwim, like all other Amphibious Animals, by the Impulſe and Retraction of her Paws; though for the Generality, ſhe contents herſelf with creeping.

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[*] Lowthorp's Abridgment. Vol. II. p. 845.

Chevalier. I have indeed taken Notice, that the Creatures of this Species, who are here in the Baſon where I have lodged my Fiſh, never ſwim, but crawl on the Earth, in the Water as well as out of that Element. One may ſee them aſcend from the Bottom, by the Aid of a Plank, and then take a Circuit on the green Turf that ſurrounds the Baſon; after which they make a ſlow Return into the Water. This is an Amphibious Animal, of a different Structure from the reſt. I wiſh his Lordſhip would juſt acquaint us with the ſeveral Species of this Creature, that are of any ſingular Uſe to us. For Inſtance, are the Tortoiſes in the Baſon, the ſame with thoſe whoſe Shells are uſed for Snuff-boxes and other Toys?

Count. They may ſerve for ſuch Purpoſes, but the Tortoiſes you ſee here are ſmall and very common. There are four or five Species of theſe Creatures, the moſt valuable of which are the * *Turtle* and the † *Carret*, as they are called: The former of theſe has not a very extraordinary Shell, but its Fleſh and Eggs are very much coveted by Navigators, who find them an excellent Refreſhment, as well as an infallible Cure for ſeveral Indiſpoſitions in long Voyages. A ſingle Tortoiſe of this Species may produce two hundred Pounds of Fleſh, which the Sailors take care to ſalt, and near three hundred Eggs, which are very large, and will keep for a conſiderable Time.

The Turtle.

The Carret.

The ‡ *Carret* is a very large Tortoiſe, as well as the other; his Fleſh indeed is not ſo delicate, but he is much ſought after for the Beauty of his Shell, which is faſhioned as the Workman pleaſes, by ſoftening it in warm Water, after which it is clapped into a Mould, whoſe Impreſſion it immediately receives, by the Aſſiſtance of a ſtrong iron Preſs;

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* Rondellet, lib. i. c. 10.

† Diction. Savari. ‡ Ibid.

they afterwards poliſh and adorn it with Chaſings of Gold and other Embelliſhments.

Chevalier. Before we quite the Article of Tortoiſes and Lobſters, I would fain know in what manner they live; for if they don't ſwim I ſhould imagine their Prey might eaſily eſcape them.

Count. Lobſters and Crabs are furniſhed with a Couple of ſtrong Claws, with which they faſten on the larger Prey, that inconſiderately happens to be near them. They ſearch the Beds of Slime and Gravel for Worms, who there make their Retreat; they draw them out of their Lodgments with their little Pincers, and find a Collation ready prepared. As for the Tortoiſe, ſhe feeds on Graſs and Weeds, in the Water as well as on the Land. She makes her uſual Reſidence, and finds her Aliment in certain Meadows, at the Bottom of the Sea, near ſeveral of the *American* Iſlands. The Water is not many Fathoms deep in ſome of thoſe Parts; and according to the Relation of * Navigators, when the Sea is calm, and the Weather ſerene, the Tortoiſes are ſeen creeping on this green Carpet, at the Bottom of the Sea. After they have fed ſufficiently, they take their Progreſs into the Outlets of Rivers for freſh Water; there they take in a refreſhing Air, and then return to their former Station. In the Intermiſſion of their Feeding, they generally float with their Heads above the Surface of the Water, unleſs they are alarmed by the Motions of any Hunters, or Bird of Prey, in which Caſe they ſuddenly plunge to the Bottom. They make yearly Viſits to the Shore, where they lay their Eggs in Cavities in the Sand, a little above the Edge where the Surges beat, and cover them very lightly, that the Sun may communicate to them a gentle Warmth, and hatch their Young; whilſt they are making Preparations for their Family, they furniſh Mankind and Birds with a very plentiful Proviſion; for they lay their Eggs thrice, at the Expiration of every fifteen Days, and generally produce fourſcore or ninety, or even more, at each Fecundation.

At the Concluſion of about twenty-five Days, the young Tortoiſes are ſeen to riſe out of the Sand, and, without any Guide or Inſtructions, march with a gentle Pace to the Water, but the Waves unfortunately throw them back on the Shore for the firſt few Days and then the Birds dart upon them, and carry off the Generality, before they have ſufficient Strength to make proper Efforts againſt the Surges, and dive to the Bottom. So that out of three hundred Eggs, it is but ſeldom that more than ten eſcape, and ſometimes they are all deſtroyed.

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* Hiſtory of the Buccaneers.

Counteſs. It ſhould ſeem, at the firſt View, that Nature, in this Inſtance, charges herſelf with an unneceſſary Expence, or is even imperfect in her Operations. But the Falſhood and Injuſtice of ſuch an Opinion is immediately evident. We never find ourſelves diſpoſed to complain of the Fertility of the Hen, who frequently preſents us with three hundred Eggs in a Year, when not one Chicken is permitted to be hatched. We are very ſenſible, that the Intention of the Author of Nature, in this admirable Prolificneſs, is to facilitate the Preſervation of the Species, and, at the ſame Time, to accommodate Man and other Animals with an excellent Food: So that nothing in the Works of Nature is either loſt or defective; and particular Advantages are derived even from the Slowneſs of a Tortoiſe's Motions; for were ſhe more expeditious, what a Number of Animals would be fruſtrated of their Food?

Prior. Let us proceed in our Examination of the various Benefits we receive from the different Species of Fiſh, and we ſhall diſcover, thro' the Whole, new Motives to adore him who has repleniſhed the Water, as well as the Earth and Air, with all Sorts of Bleſſings.

Count. Thoſe very Fiſh who are diſagreeable to our Palate, are nevertheleſs not unprofitable to Man. We have already obſerved, that Northern Fiſh, whoſe oily Taſte is offenſive to us, afford a Suſtenance to other People, whoſe Neceſſities they can better accommodate. The very Fins, the Scales, and moſt inconſiderable Parts of theſe Animals, are extremely ſerviceable to ſeveral Nations. There is one Species of Fiſh, whoſe Fins are ſo very ſtrong, that the Inhabitants of *Greenland* uſe them for ſewing the Skins of Bears, which furniſh them with their Dreſs, and which they tack together with Strings made of the dried Entrails, which ſerve their Purpoſe inſtead of Thread.

The ſame People build the Hulls of their Veſſels with the Bones of Whales, and afterwards line them with the Skins of Sea-Calves, or Whales themſelves. A Man ſinks half his Body into the Hollow of one of theſe Boats, and ſits with his Feet extended at the Bottom, and the Extremity of his Coat of Skins perfectly covers the round opening in which his Body is fixed. The *Greenlanders*, with their left Hand, work a little Oar, or Paddle, ending with a double Blade, and arm their right with a Harping-iron; and with this Equipage ſwim very lightly on the Water, braving the Tempeſts, and aſſaulting the Whales and Purpoiſes that afford them their Subſiſtence. Theſe Boats are more ſerviceable, ſafe, and expeditious than our own.

Chevalier. For what Reaſon then do we make no uſe of them?

Counteſs. Would you have it ſaid, that the *Europeans* are inſtructed in any Particulars by the Inhabitants of *Greenland*? You know we have all the Knowledge to ourſelves.

The Glew of Fiſh.

Count. There is a Fiſh in the Northern Seas, from which the *Muſcovites* extract a Glew that is extremely beneficial; it clarifies our Wines without the leaſt Diminution of their Goodneſs, and never communicates to them any Quality of its own: Our Manufacturers uſe it to ſtrengthen and poliſh the Warp of their Works; and it is frequently employed with Succeſs, where even ſtrong Glew will not ſtick.

The Walruis.

The *Danes* and other Northern People catch a very large Fiſh called a *Walruis* or *Narval*, whoſe Teeth are more eſteemed than thoſe of the Elephant, becauſe they are an Ivory of the pureſt Whiteneſs, and not ſubject to grow yellow. The left Jaw of this Creature is armed with an Ivory Horn, extending ſometimes to a Length of fourteen, fifteen and ſixteen Feet: Theſe Horns are to be met with in the Cabinets of the Curious, and have been thought to belong to the Unicorn †, who is an Animal intirely chimerical, or at leaſt undiſcovered by the Moderns, whatever Knowledge of him might be among the Antients.

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† The Unicorn is an Animal very different from the common Idea of him. See Bochart's Hierozoic.

But of all the Species of Fiſh, who are never brought to our Tables, the Whale is undoubtedly the moſt beneficial: It is an Animal of a ſtupendous Size, an hundred and thirty, an hundred and ſixty, and ſometimes two hundred Feet in Length, and extremely profitable to thoſe who engage in that Fiſhery.

Chevalier. How is it poſſible to conquer ſuch a monſtrous Creature? He muſt certainly rend and deſtroy whatever comes in his way.

Prior. The Fiſhery is exceedingly curious, and I will give you the Deſcription of it in a few Words. This Creature is found in the moſt Northern Parts of *Europe*, which are reſorted to by a great number of Veſſels, appropriated to that kind of Capture. When a Whale makes his Appearance on the Water, the moſt vigorous and bold Fiſherman takes a Harping iron, which is a Javelin well ſteel'd at one Extremity, and five or ſix Feet long, and to which is faſtened a Line of above an hundred Fathoms in Length. When once this Inſtrument has been darted into the Fat and Fleſh of the Whale, the Affair is all over, and the large Animal plunges to the Bottom, and the Harponiers let the Line run out very quick. When they have not a ſufficient Quantity, to enable them to purſue the Fiſh in its Career, they faſten to the End of the Line a Gourd, hollowed within, and well cloſed up, and carefully obſerve its Motion, that they may find the End of the Line, and know where the Whale conceals himſelf. The Creature, after loſing his Blood, ſometimes riſes to the Surface of the Water, or elſe they drag him up with the Cord; they then endeavour to get him into their Poſſeſſion, draw him to the Shore, and cut him in Pieces.

Chevalier. If the Fleſh be not eaten, to what other Uſe is it applied?

Prior. The Fat of a ſmall Whale, about ſixty or ſeventy

Feet long, ſometimes produces an hundred Caſks of Oil; and a Whale of two hundred Feet in length, generally yields ſixteen or twenty Tons.

Chevalier. What may this Oil be good for?

Prior. It furniſhes a very conſiderable Trade: They uſe it in dreſſing certain Skins, and it thickens the Pitch, with which they kalk Ships; they likewiſe dreſs Wool with it; and it proves a neceſſary Ingredient in Soap: It is even employed in Painting and Phyſick: But it is more eſpecially of infinite Uſe in the North, where it furniſhes a frugal Light, in the long and diſmal Darkneſs of thoſe Regions.

Counteſs. Do theſe great Fiſhes ſupply us with the Whalebone which we purchaſe of the Merchant?

Count. The Name of Whale is given to two ſorts of Fiſh; one is ſmall, furniſhed with Teeth, and his Brain produces that white Subſtance called *Sperma Ceti*, ſo much eſteemed by the Ladies. The other is the large Whale, who is deſtitute of Teeth, but then he is ſupplied with two large Tuſhes, a dozen or fifteen Feet long, which riſe out of his Jaws, and conveniently enable him to amaſs together the Weeds, which are generally ſuppoſed to be his Food, becauſe Quantities of them have been found in his Stomach. Theſe Tuſhes, ſplit into ſmall Diviſions, are the pretended Whalebone, or that ſtrong and pliant Subſtance we buy of the Merchant under that Name; and whoſe preſent Uſefulneſs ſeems almoſt confined to the Hoop-petticoat; a Mode of Dreſs altogether ſenſeleſs and unamiable, but which the Ladies have taken a Reſolution to continue, becauſe they think it gives them leſs Conſtraint than the Dreſs they have now diſuſed.

Counteſs. What does your Lordſhip mean? In Matters of Mode, the weakeſt Heads preſcribe Rules to the wiſeſt. But let us not wander from our Subject. Theſe great Whales put me in mind of an amphibious Animal above an hundred Feet long, and with whoſe Deſcription you entertained us the other Day.

Crocodiles.

Count. You mean the *American Crocodile.* But I would not give too much Credit to the Relations of old † *Spaniſh* Travellers, who are very apt to enlarge in their Deſcriptions. The Crocodile who lives in the *Nile*, the *Niger*, and ſome other Rivers of *Africa*, has no ſuch Length; ſome of theſe Creatures are fifteen, eighteen and twenty Feet long, but they very ſeldom exceed twenty five; which is a Length ſufficient to give the Animal a very monſtrous and formidable Appearance.

Chevalier. Is not this the Animal who reſembles a large Lizard, and has Jaws armed with Teeth, ranged like thoſe of a Saw, and a Body and Tail covered with large impenetrable Scales, and who, according to the Accounts given of him, very artfully ſeizes young Children, when he diſcovers them on the Banks of the River in which he lyes concealed?

Count. The very ſame.

Prior. This Animal, were he too prolific, would reduce Mankind to the greateſt Deſolation. But God has prepared for him a couple of Enemies who are always contriving his Deſtruction: And theſe are the *Hippopotamus*, or Sea-horſe, and the *Ichneumon.*

The Hippopotamus.

The *Hippopotamus* § is a very large amphibious Animal, who lives at the Bottom of the *Nile* and *Niger*, from whence he riſes, not by any Effort of ſwimming, but by crawling with his four Feet, when he goes to feed in the Meadows, or even on the Tops of Mountains: He grazes in the Herbage, and then returns to his Station in the Water, where he is in a perpetual State of War with the *Crocodile.*

The Ichneumon.

The *Ichneumon* is a Water-rat, or little Ferret, and the *Crocodile's* great Terror. Some Travellers aſſure us, that he creeps down that Creature's Throat when he is aſleep, devours his Entrails, aud kills him with extreme Pain; after which, he feeds on him at leiſure. Others inform us, that they are unacquainted with this Fact, but have frequently ſeen the *Ichneumon* throw himſelf on the Eggs; left by the *Crocodile* in the Sand, and which he deſtroys to the utmoſt of his Ability.

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† See the Leviathan of Samuel Bochart, Hierozoic. lib. 4.
§ See the Behemoth of Bochart, Hierozoic. lib. iv. c. 15. 16.

Count. If the *Chevalier* has any Curioſity to ſee the Figures of the *Crocodile*, the *Sea-horſe*, and *Ichneumon*, comprehended in one Piece of Sculpture, he muſt go to the *Tuilleries*.

Chevalier. To what particular Part, my Lord?

Count. Have you never taken notice of a Statue that repreſents the *Nile*, with fourteen other Figures of its young Offspring?

Chevalier. I have frequently ſeen it, without comprehending any Part of the Statuary's Intention: Pray, what may be the Signification of all this Progeny, and the Figures that are round the Pedeſtal?

Count. The fourteen Children of the *Nile*, ſome of whom are placed above, and others below, are the Symbols of the different Riſings of that River, which are extremely beneficial to *Egypt*, when they aſcend to the Height of fourteen Cubits; and the Country is threatned with Famine, when they have a leſs Elevation: If the River ſwells to fifteen Cubits, a great Plenty infallibly ſucceeds; but when it riſes to ſixteen, the Conſequence is intirely different. Fourteen Cubits are the neceſſary Standard. Under the Figure of the God of the *Nile*, leaning on his Urn, is a large Bed of white Marble, round which you will ſee in *Relievo* the Objects peculiar to *Egypt*, ſuch as the *Lotus*, a Plant with vhich the Inhabitants make a kind of Bread, or broad thin Cakes; the *Ibis*, a kind of *Stork*, who purges the Country rom Serpents; and the *Ichneumon* and *Sea horſe*, combating he *Crocodile*.

Counteſs. Gentlemen, I have permitted you this Day to diſcourſe on every Subject you thought proper; but I intend to make a better Uſe of my Prerogative as Preſident, and ſhall recal you to thoſe Subjects that are more ſuited to my Capacity. I propoſe to the Company, for our next Converſation, the Article of Plants, with their Flowers and Fruits. Next to my Birds, this is the Subject wherein I have moſt Experience.

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PLANTS.

DIALOGUE XIV.

The COUNT, *and* COUNTESS. *The* PRIOR, *and* CHEVALIER.

Counteſs. CHEVALIER, we make you a Proficient in all the Arts and Trades in their Turn. You have already gone through thoſe of an Hunter, a Weaver, a Fowler, and a Fiſher: To Day we ſhall teach you to be a Gardener.

Chevalier. Muſt we part with Animals ſo ſoon: There are vaſt Numbers of them who have never been the Subject of our Converſations. His Lordſhip, tho' he has no great Eſteem for the Theatre of *Ruſſian* Animals, permits me ſometimes to view the Figures which are very numerous in that Work. I looked them over Yeſterday, and did not ſee one new Animal whoſe Name, Reſidence, and Profeſſion, I had not a Curioſity to know. I fancy it would be very entertaining to be acquainted with them all.

Count. This is the very Inclination with which I was deſirous of inſpiring you, and each Animal merits a particular Conſideration and Study. The ſingle Trunk of an Elephant would furniſh ſufficient Matter for ſeveral Converſations: But we don't intend to exhauſt every Subject, and fatigue you with too many Particulars; we only deſire to raiſe in you an Inclination to theſe Amuſements, and after we have made you ſenſible that much greater Advancements are practicable, 'tis proper to leave the reſt to your own Examination.

Counteſs. But do you imagine, *Chevalier*, that we turn the Converſation from Animals, when we diſcourſe of Plants? No, ſurely, for even theſe are a Species of Animals, who, tho' they don't move from Place to Place, have yet their proper Suſtenance, and become Founders of a numerous Poſterity, as well as thoſe who march up and down.

Prior. What her Ladyſhip advances in a Vein of Pleaſantry has a great Air of Truth. The Root, according to Obſervations, ſupplies the Plant with a Stomach for digeſting the Nouriſhment; the Bark is a Skin which covers all the Veſſels, the Stock is the Body of the Animal; and the Sap, which aſcends from the Root to the Branches, and then returns from the Branches to the Root, has a perfect Conformity to the Blood that circulates in the Bodies of Animals.

Count. What is your real Opinion, Sir, of this pretended Circulation of the nutrimental Juice? Are you perſuaded it is Fact?

Prior. Every Circumſtance ſeems to intimate the Affirmative; but before we undertake to diſcuſs this Point, we ſhould do well to conſider the Origin of all Plants, and their eſſential conſtituent Parts; after which, we may proceed to the Manner of their Nouriſhment.

Count. I am willing we ſhould purſue this Method. *Chevalier*, do you recollect the general Origin of all Plants?

Chevalier. They riſe from Seeds.

Count. Do you believe then that the Earth cannot with its Heats and Juices form a Plant at once, without the Concurrence of Seed?

The Origin of Plants.

Chevalier. It cannot produce the leaſt Blade of Graſs. I remember your Lordſhip told me, with Relation to Animals, that the Earth nouriſhes every individual, but cannot form an organized Body. The ſame Order and Deſign viſible in Animals is to be diſcovered in Plants. The Juice of the Earth may indeed nouriſh a Plant, and that is the utmoſt of its Operation, but it cannot give it its original Exiſtence.

Count. In Reality, if the Juice of the Earth could produce Plants, it muſt be endued with all the Omnipotence of the Creator, in order to give an inſtantaneous Exiſtence to the Roots, the Ducts, the Fibres, the little Veſſels appointed for the Reception and Diſtribution of the Sap, the Glands to filtrate and proportion it to the Delicacy of the Veſſels into which they are admitted, the Vents or Spiracles to receive and diffuſe the Air ; in a Word, all the Parts of a Plant, as the Bark, the Wood, the Pith, the Buds of Branches, Flowers, and Fruits. This Juice muſt be gifted with Intelligence to be capable of ſuch a Variety of Operations, and never by Miſtake to cauſe one Plant to produce the Gems and Fruits of another Species.

Chevalier. I am not able to comprehend how any one can think the Earth qualified to form the Body of a Plant. I would as ſoon ſay, it had produced Mankind, and even the Moon and Sun.

Count. I am exceedingly delighted at your diſcovering the Neceſſity of reſorting to the Agency of an Almighty Being. He indeed is incomprehenſible, but without him it is impoſſible for any Thing to be intelligible. When his Interpoſition is once ſuppoſed, 'tis eaſy to conceive the Poſſibility of producing all Things. He alone was capable of forming the Matter which conſtitutes all Bodies, and none but himſelf could extract out of this Matter ſeveral Elements, each of which is perpetually the ſame, notwithſtanding their different Combinations form an infinite Variety of Bodies. The Elements may indeed make mutual Approaches, and intermingle with each other, but the Reſult will be no more than a Heap of confuſed Maſſes ; there will be neither Organs, nor Life, nor Soul. Let us ſuppoſe the Earth to be newly created, it will for ever continue naked and barren, if it be not arrayed and peopled by the Deity. He alone can organize Bodies, and animate ſuch organized Species as Plants and Animals. The minuteſt Sprig of *Sorrel* or *Chervil* is formed, like all the reſt of the Creation, by a particular Plan and a ſpecial Will.

As to the Manner of perpetuating Animals and Trees after their firſt Formation, the Deity might either determine to create more, whenever it ſhould be neceſſary to ſubſtitute a new one in the Room of another that Age had decayed, or he might at once provide for all Succeſſions of Ages, by incloſing in the Seed of the firſt Tree all its Poſterity in Miniature; ſo that each Species muſt unavoidably produce its own Reſemblance, and the Earth would be only charged with a Contribution of Juices neceſſary to nouriſh and unfold the Seed; and indeed this is the magnificent Order he has been pleaſed to eſtabliſh. The Imagination is aſtoniſhed to find Millions of Seeds involved in one another; but Reaſon teaches us to receive the Fact without Heſitation, becauſe the Great Creator is omnipotent.

Count. Be upon your Guard, *Chevalier*, you will receive a briſk Attack from me. There are ſome Plants, ſuch as *Muſhrooms* and *Fern*, that don't exhibit any Seed to our View, and yet ſhoot forth daily, and grow in different Situations: God muſt therefore either create them anew, or the Juices of the Earth put into Motion are qualified for the Production of organized Bodies.

Chevalier. I don't know, my Lord, whether the *Prior* may be a Prophet, and knew four Days ago, that you intended to embarraſs me with your *Fern*; but, however, he furniſhed me with the Anſwer I ſhall now give you. He directed me to place my Ear cloſe to a Paper, where at firſt I was not ſenſible of any Noiſe, but afterwards heard a ſmall Sound or Crackling, which made me very attentive to diſcover the Cauſe: And I then obſerved a Number of little Grains, ſkipping over one another, like Mites in a Cheeſe; but by the Aid of a Miſcrope, I had a very different View, for theſe Grains were a Parcel of Shells that contained a Quantity of Seed. The Dryneſs of theſe Shells made them crack, and the ſmall Grains ſhot and diſperſed themſelves up and down. Theſe were the very Seeds of *Fern*, and now your Lordſhip may tell me, if you pleaſe, that this Plant produces none.

Count. But you are ſilent as to the *Muſhroom*.

Chevalier. Give me Leave to tell your Lordſhip, that you are not eaſily ſatisfied; were it true, that we cannot diſcover any Seeds in a Muſhroom, I would ſtill maintain it does not want them, though they are too ſmall to be viſible, and ſo very light that they are wafted up and down by the Wind.

Count. The Fact is undeniable, if in this Particular we may judge of the Conduct of the Deity by that which he never departs from in ten thouſand other Inſtances.

The Seed.

Counteſs. Every Plant is produced by Seed. This is a Truth familiar to our Experience; but let us enquire into the Nature of a Seed, and what it diſcovers to our View. You, Gentlemen, who have examined theſe Particulars with your Glaſſes, can give us ſome Light into the Affair.

The Manner in which Seeds are enfolded and covered.

Count. We will begin with the external Appearance. All the Seeds of Plants have different Sheaths, which incloſe them till they are lodged in the Earth: They are capable of being turned, meaſured, and heaped up, without the leaſt Prejudice, becauſe they are inveſted with a Covering and defended from Danger. Some of theſe Seeds, as the Kernels of Apples and Pears, are placed in the very Heart of the Fruit, whoſe Subſtance conſequently performs the double Function of enfolding the Seeds whilſt they continue tender, and nouriſhing Mankind, when the Seeds, in their State of Perfection, no longer want a Surtout. Others grow in Shells, and of this Sort are Peas, Beans, Lentils, Poppy-Seeds, and Cocoa-Nuts: A third Sort, beſide their Incloſure in the Subſtance of the Fruits, are ſhut up in thick Shells of Wood, and of this Species are Walnuts, Almonds, Apricocks, Peaches, Plums, and other Kinds. Several, beſide their wooden Shell, have likewiſe a bitter Rind, which is the Caſe of Walnuts, or a Covering ſhagged with Prickles to preſerve the Seeds from all Injury, till they have completed their Maturity; Cheſnuts belong to this laſt Claſs.

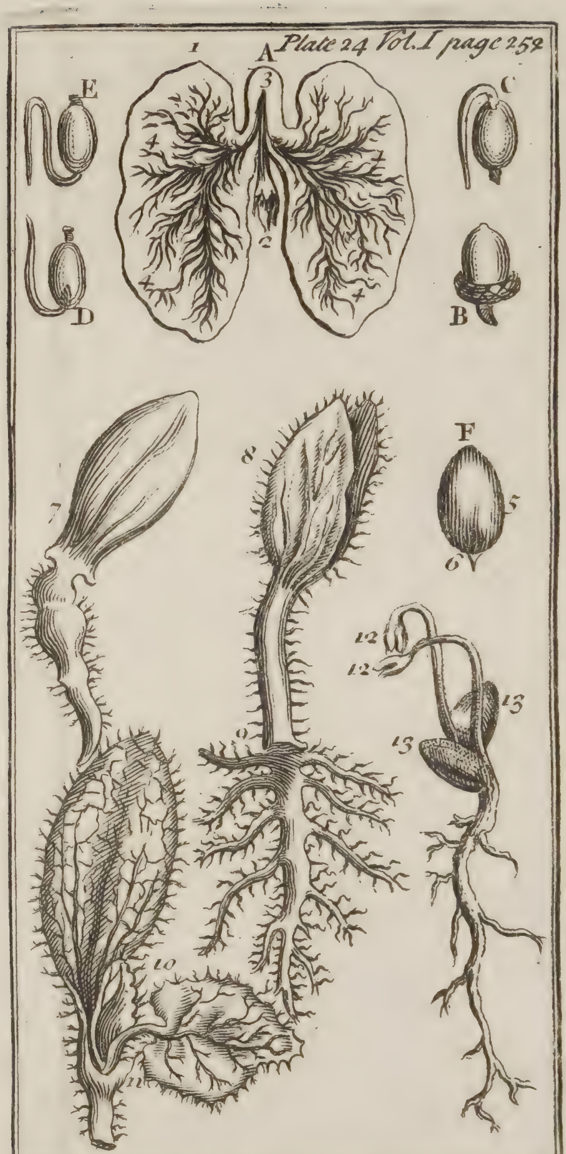
Chevalier. I find that Fruits of a moderate Goodneſs have a Variety of Preſervations; but in my Opinion, the Peach which is ſo excellent, is much more intituled to the Protection of a ſtrong Shell; we ſhould then enjoy it for a longer Seaſon.

Prior. Give me Leave to tell you, *Chevalier*, that God is equally free and fertile in his Operations: He has furniſhed the Generality of Seeds with a Covering of Wood, and has not thought it proper to afford one of equal Strength to the Subſtance of Fruits, which in Reality is no more than a Covering or Defence to the Seed: He has incloſed ſome particular Fruits in a light Skin, others in a ſolid Bark: He alone fixes the Regulations, and is not ſubject to any Reſtraint. But though it be incumbent on us, only to celebrate his Choice of one Method in Preference to another, we may be ſometimes indulged in a modeſt Attempt to diſcover the Reaſon of ſuch a Proceeding. The Peach and Plum are appointed for our Refreſhment at the Cloſe of the violent Heats; in any other Seaſon they would chill us, or at leaſt be depreciated by the Variety of other Fruits. As therefore their Appearance is limited to a ſhort Period, their Clothing is proportioned accordingly, and a ſimple Gawſe is ſufficient. The Apple and Pear which are intended to ſucceed them, and continue even in the Winter Seaſon, have received a more compact Array: For which Reaſon, Cheſnuts, and other Species of Nuts that are to laſt all the Year, are ſtill fortified in a better Manner. Cheſnuts are the Food of whole Nations: But the little Birds would deſtroy them in their tender State, and therefore, to preſerve them from ſuch Inſults, Nature has ſhagged their Out-ſide with Prickles; and perhaps intimates to us by ſuch a Precaution, that they are capable of furniſhing us with more conſiderable Advantages. Nuts are the Suſtenance of ſeveral Animals as well as of Men: They produce an Oil proper for burning, and which likewiſe preſerves our Paintings and other Furniture, and gives a Suppleneſs, Strength and Coheſion to Leather. The Walnut is delicious even in its State of Immaturity, and furniſhes our Tables with a Regale comparable to the fineſt Peach. Such a delicate Food would attract all the Birds, and deprive Man of many Conveniencies, did not the bitter Flavour of the Rind prevent thoſe Animals from piercing it with their Bills.

The Epidermis.

Count. Beſides theſe outward Foldings every Seed has its Bag, and its *Epidermis* or fine Skin, in which the Pulp and the Bud are involved.

We may form a Judgment of all other Seeds by the Structure of a Pea, a Bean, or the Kernel of a Melon: The Texture is very near the ſame throughout the whole. Take away the Covering which infolds a Bean or any other Seed you pleaſe, you generally diſcover two Pieces which part in



L. Hotte sculp.

Seeds.

in your Hand, and are called the Lobes of the Seed: Theſe are nothing elſe but a Compoſition of a Kind of Meal, and the nutrimental Juice or Sap of the Earth, which form a Pap or milky Subſtance proper to nouriſh the Seed.

The Lobes.

At the Top of the Lobes, the Bud is planted and ſunk in like a ſmall Stud. It is compoſed of * a Stock and a Pedicle, which laſt will afterwards be the Root. The Stem or Body of the Minute-plant, is ſunk a little into the inward Subſtance of the Seed; and the Pedicle or ſmall Root, is that Point which we ſee diſpoſed to ſhoot forth the firſt, from the Foldage that encloſes it.

The Bud.

The Pedicle, or Tail of the Seed is faſtened to the Lobes by two Bands, or rather branching Tubes, whoſe Ramifications are diſperſed through the Lobes, from whence they are appointed to derive the Juices neceſſary to the young Plant.

The Pedicle.

The Stock or Body of the Plant, is enfolded by two Leaves that entirely ſurround it, and keep it fixed as in a Box, or between a Couple of Scales.

Theſe two Leaves are the firſt Parts of the Plant that diſengage themſelves from the Seed and the Earth, and are the Harbingers of the Trunk, the exceeding Delicacy of whoſe Texture they preſerve from all Colliſions that would prove injurious to it, and perhaps they may be ſerviceable in Inſtances of quite another Nature. As both theſe Leaves are, in many Plants very different from the true Foliage, and the firſt that riſe from the Seed, to preſerve the tender Infancy of the Plant, they are called the Seminal Leaves. There are ſome Seeds, whoſe Lobes extend themſelves out of the Earth, and ſeem to perform the ſame Functions as the firſt Leaves.

The Seminal Leaves.

After the little Root has been nouriſhed by the Juices it extracts from the Lobes, it finds either in its own Incloſures, or elſe in the Skin of the Seed, a ſmall Aperture which correſponds with its Point, and is diſcoverable by the Aid of a Microſcope, in the Shell of the hardeſt Nuts, as well as in the Skin of the

The Root.

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* Malpighi Anat. Plant.

the Seed. Through this Aperture the Root paſſes, and ſhoots into the Earth ſeveral Fibres, which are ſo many Canals for the Conveyance of the Sap into the Body of the Root, from whence it riſes into the Trunk, and gives it its Elevation in the Air. If the Trunk meets with a Maſs of very compact Earth, it turns aſide into another Direction, being unable to pierce through the firſt Obſtruction, and ſometimes burſts and dies for want of Force to proceed further: On the contrary, if it bears againſt Earth that is light and ſoft, and which Qualities it ought to receive from the Labour of the Gardener *, it then purſues its Way without any Impediment. The Lobes, after they have exhauſted themſelves for the Benefit of the young Plant, extract a Nouriſhment for themſelves and then wither away: The ſame Fate attends the Seminal Leaves, which, by the Miniſtration of their Pores, imbibe from the Air a genial Humidity, and a Flow of Spirits that are ſalutary to the Plant, and when their Services are completed, they fade and die away. The young Plant, by the Inſtrumentality of its Root and Fibres, draws from the Earth more ſtrong and copious Juices than it was at firſt ſupplied with by the Seed; it faſtens itſelf more and more, and begins to unfold its different Parts, that before were rolled up and involved in one another. Let us now proceed to the Parts within.

The-Pith. The Pith which is a Syſtem of little Cells, ſeparated by Interſtices or Partitions of a very thin Texture, is lodged in the Heart of the Trunk and Branches; and there great Quantities of Sap are diſcovered.

The Wood. Round the Pith a Multitude of hollow Fibres riſe in lateral Ranges, diſpoſed in Packets one againſt another. All theſe Packets aſcend the whole Length of the Plant, and are compacted together by ſeveral Fibres, paſſing in an oblique Direction from one Range to another, and frequently croſſing each other like the Figure of an X, or the Meſhes of a large Net, in ſuch a Manner, that theſe Fibres frequently admit of Spaces between them, which are ſometimes in the Form of Lozenges, ſometimes ſquare, but generally oblong. This Syſtem of long Tubes that aſcend round the

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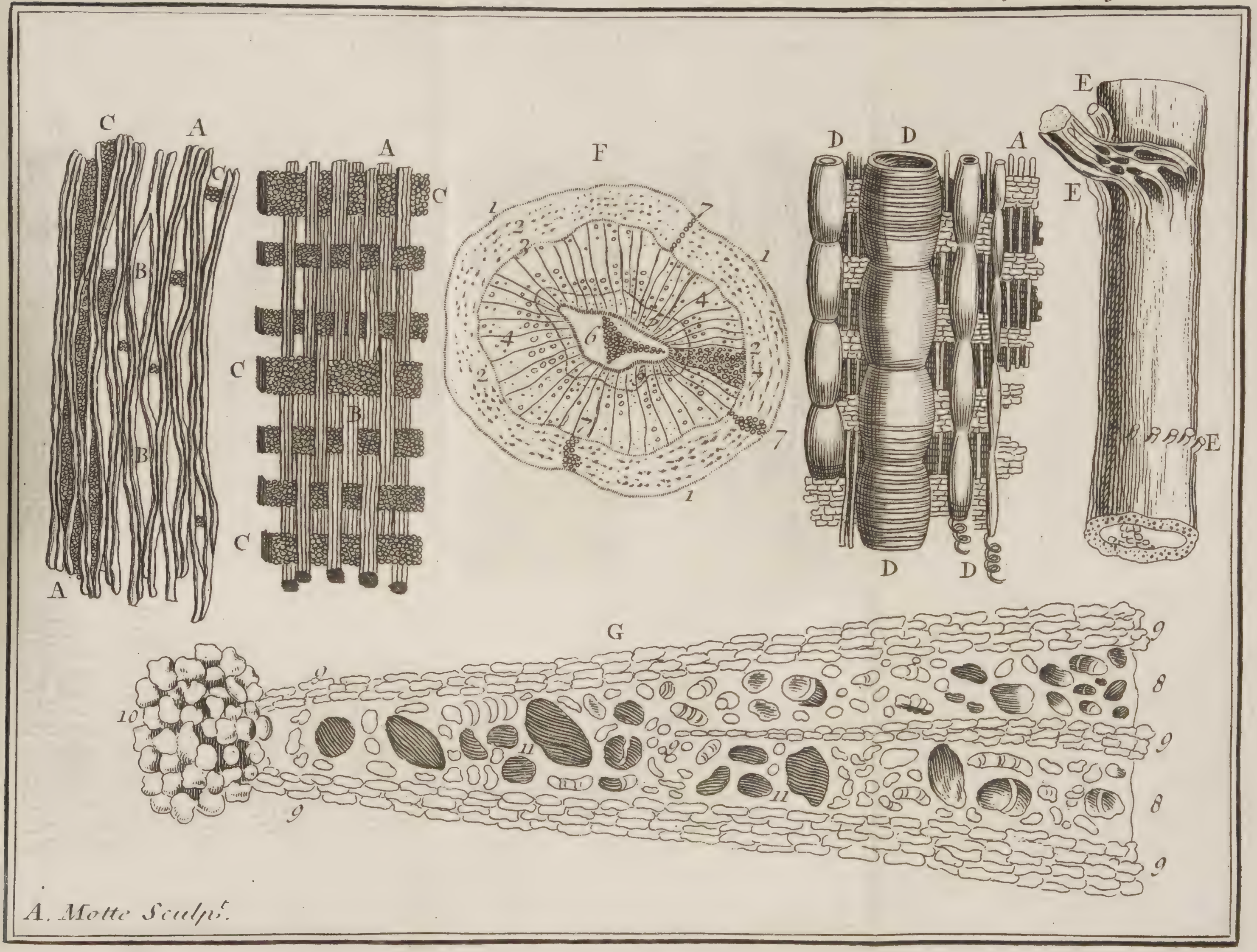
* Hoc imitatur arando. Virgil, Georg. 2.

Heart

Plate 25 Vol. I page 254



A. Motte Sculp^t.

The Inward Substance of plants.

Heart form what we properly call the Wood, and are appointed to convey the Sap.

The Bark. Round the Wood is another Aſſemblage of hollow Fibres, ranged almoſt in the ſame Manner, and theſe are called the Bark. There are three Parts to be taken Notice of, which differ from one another; the inward Bark or fine Skin, immediately contiguous to the Wood; the *Epidermis* or outward Skin, which is a Net extended over all the exterior Surface of the Tree, and the intermediate Bark or thick Subſtance between the two preceding Skins.

The fine Bark. The fine Bark has a very ſingular Uſe in Trees: It ſeems to be a Collection of little Skins, or a Tiſſue of Fibres glewed over one another; the firſt inward Round of which diſengages itſelf from the reſt in the Spring, and adds a new Circumference to the Wood through its whole Length. Trees, like Inſects and Reptiles, have ſeveral Skins folded over one another; but then Reptiles and Inſects diveſt themſelves of theſe firſt Skins, and entirely quit them to appear from Time to Time in a new Form and another Array; whereas Trees have annually a new Habit, but then it is caſt over the preceding, the Bark ſerving for a Surtout. It is evident that the fine Bark furniſhes the Tree with the Rounds of Fibres that yearly enlarge its Bulk, becauſe when the large Bark, with that which is inward, is cut off in any Part leaving the Wood expoſed to View, you muſt never expect that the Wood will receive any Augmentation there: Both the Bark and the Wood continue their Growth in the adjoining Parts, but the Aperture remains as it was firſt made, and can only be cloſed up in a long Proceſs of Time, by the lengthening of the Protuberances formed by the neighbouring Fibres.

'Tis eaſy to diſtinguiſh theſe annual Accretions in Trees; one need only cut a Trunk or a large Branch horizontally, to diſcover the ſeveral Circles or different Degrees of Thickneſs round the Heart, and one may infallibly determine the Years of the Tree's Age, by the Number of Circles viſible in the Wood: The laſt Revolutions are always of a lighter Conſiſtence, and are called the ſappy Parts of the Wood, which are rejected by the Workmen, as too weak to be any Way ſerviceable to their Purpoſe. Theſe ſoft Parts contract a Solidity in the ſucceeding Years, they likewiſe become more compact, and in no Particular differ from the real Wood. The Tree, by its perpetual Increaſe in Strength and Circumference, forces the Fibres of the Bark to ſtretch and extend themſelves, and the outward Surface ſometimes burſts with a ſurpriſing Noiſe; this occaſions the Crevices, which are always enlarging in the external Bark, in Proportion to the Growth of the Tree.

The Sap Veſſels.

We have obſerved, that the large Bark as well as the ſmall, the ſappy Parts and the real Wood, are compoſed of long Rows of Tubes or hollow Fibres, that aſcend and join together, or have a Communication with one another by the Agency of tranſverſe Fibres, and there muſt conſequently then be ſeveral Spaces between theſe Fibres: All theſe Kinds of open Meſhes are filled with little Veſſels or Bags of an oval Form pierced at the two Extremities, and joining to one another at each End like a String of Beads, ranged at the ſame Time in Heaps one above another, and extending in an horizontal Line from the outward Bark croſs the other two, and the Wood, and ſo to the Pith itſelf: Theſe Veſſels are generally filled with Sap.

Beſide the Fibres that aſcend from the Root, and conſtitute the Wood and Bark, there are other Veſſels diſpoſed in the ſame Manner, and ranged along the Fibres at proper Intervals of Diſtance, through the whole Subſtance of the Wood; theſe form the Air Vents, and the Veſſel properly ſo called.

The Air Vents.

The Air Vents are a Set of Tubes, compoſed of Fibres revolving in a ſpiral Line, and in one Part extended in little Ramifications to the external Air, and in the other continued and enlarged to the very Root: Theſe Veſſels are always empty.

The proper Veſſels.

The proper Veſſel is a large Duct filled with Oil, extended in Length between the Fibres of the Wood, and riſing in different Ramifications like the Air Vents to the Top of the Plant, and the external Air: I call this the *Proper Veſſel*, becauſe it contains an Oil which varies according to the Nature of the Plants, each Species being impregnated with a viſcous Fluid, proper, and indeed peculiar to it. In ſome Plants this Veſſel contains a kind of Turpentine; in others 'tis a Sort of Roſin or Pitch; here it proves a Gum, and there it is a Species of Milk: 'Tis elſewhere a real Oil, and ſometimes it aſſumes the Qualities of a Honey, a Syrup, or a Manna.

The Knots.

We muſt now beſtow a few Words on the Origin of Knots, and the Nature of the Buds that are always lodged in them. Towards the Top of the Plant, and in ſome other Parts of the Trunk and Root, Rows of little Branches ſhoot from the Body of the Wood, united and interlaced with each other; theſe traverſe the Wood, the ſappy Subſtance and the Bark, and their Extremities are projected to the external Air: Theſe Rows are compoſed of hollow Fibres, proper Veſſels, and eſpecially Air Vents or empty Spiracles. The Union of ſo many different Veſſels ſwells and enlarges, in ſome Meaſure, that Portion of the Bark in which they terminate; and this is what we call the Knots, the whole Syſtem of which is calculated for the Service and Growth of the Buds. Theſe are ſo many little intire Plants, all furniſhed with their Veſſels and other Parts, rolled over one another like Threads wound into a Ball: The Outſide is defended by ſeveral Foldings, and they are lodged in the Knots of the Tree, that they may extract from them in their Turn all the Nouriſhment neceſſary to their Expanſion: I ſay in their Turn, becauſe theſe Buds are ſubject to the ſame Proceſs that appears in the Eggs or Seed of the young Offspring of Animals; there are Degrees and Diminutions of Growth that reach, as one may ſay, to Infinity itſelf. The Wiſdom and Goodneſs of the Creator is as conſpicuous in this Oeconomy as his Power itſelf; ſince it not only ſupplies us with excellent Fruit this Year, but reſerves a Liberality of the ſame Preſents for the next; and by preventing all the Buds from opening at the ſame Time, by unequal Preparations, he treaſures up for our Tables and Fires a Stock of Supplies that are really inexhauſtible.

The Root.

Our Obſervations have hitherto been confined to the Trunk or Body of the Tree; we will now proceed to the Head and the Root. This latter appears to be only a Continuation of the ſame Parts we have already conſidered in the Trunk: The Fibres that ſhoot from it on every Side are probably an Extenſion of all

The Fibres.

the leſſer Veſſels that terminate in the external Bark, and there form Knots to recruit the Tree, both in the Earth and without. In the latter Situation, when the Tree is ſtripped of its Branches; in the former, when ſome Accident has deprived it of its Root: All theſe little Veſſels incloſe others of the ſame Structure, and whoſe Minuteneſs is inconceivable; all of them likewiſe having other Knots and other Buds, and Means, without End, to preſerve the Tree, and perpetuate the Species.

Slips and Layers.

We diſcover the Proof of this amazing Arrangement in Slips, and Layers. A Slip of the Willow or Gooſeberry-tree, or, in other Words, a ſimple Stick of each Species, immediately takes Root when ſtuck in the Ground.

The Branch of a Vine, laid and bent into the Earth, ſhoots out Fibres through the Knots that are buried; Cut the Branch off, where it joins with the Stock, and the other End that riſes out of the Ground becomes a new Vine.

Shoots.

The Strawberry Plant ſpontaneouſly throws out, on all Sides, Trains or long Fibres, which have Knots. Theſe latter extend their Filaments in the Earth, and become ſo many new Stems. The Water and Salt, the Oil, Air, and Fire, which contribute to their Growth, are not furniſhed with any Intelligence, to enable them to deſign or form, to place or play off the Inſtruments neceſſary to the Life of the new Plant: All theſe additional Roots, that ſpring from Knots, frequently imperceptible in the Slips and Layers, were lodged there in Miniature, and are only a Syſtem of Branches, which conſtituted the Knots of the Stock, and which are then lengthened and diſengaged from their former Conſtraint, and conducted under the Earth, according as the Sap flows into their Apertures.

The Head of the Tree.

As to the Knots and Bud, which form the Head of the Plant by furniſhing it with Branches, Leaves, Flowers, Fruits, and Seed, a particular Account of their various Manners of expanding themſelves would be endleſs: Let us content ourſelves therefore with obſerving, that the Branches and Pedicles of both Leaves and Flowers are ſo many Extenſions and new Diſtributions of all the Veſſels we have ſeen in the Stock; that theſe Veſſels afterwards expatiate, more at large thro' the whole Extent of the Leaves; that the Fibres of Wood are diſtributed in long Ranks, which we call the Ribs; that theſe Fibres ſuſtain the Air Vents and the Veſſel of Oil; that the Orifices of the Vents and proper Veſſels are on the upper Part of the Leaf, and open to the Sky; in a Word, that croſs the Fibres, and in the whole Subſtance of the Leaves and Flowers, a vaſt Number of little Veſſels are placed in horizontal Lines, the Plenitude and Variety of whoſe Juices fortify the Leaf and Flower, and paint them with their different Glow of Colours.

Theſe, my dear *Chevalier*, are the Particulars we have frequently diſcovered, with our Microſcopes, in the Generality of Plants; and indeed, they are no more than a ſhort Sketch and imperfect Outline. We muſt now animate the whole Syſtem and ſhew you the Progreſs of the Sap, and the proper Juices. But if all theſe minute Parts are difficult to be diſtinguiſhed, the Uſe of each Veſſel, and the Courſe of their Fluids are attended with much more Intricacy. I have frequently attempted to diſcover the Cauſe of the Sap's Motion: I think I have obſerved its Circulation, and had ſome imperfect View of the manner in which it is performed, but I durſt not attempt any thing on that Article.

Chevalier. Perhaps the *Prior* may not be ſo timorous.

Prior. I will venture at one Conjecture, and let it be regarded by the Company, no otherwiſe than as it may appear natural and agreeable to Experience. It ſeems to me, that the Impulſe of the Air is capable of circulating the Sap, thro' the Veſſels whoſe Structure has been deſcribed to us, and is ſufficient to produce the ſeveral Kinds of Progreſs, and all the Variety of Accidents viſible in Trees.

If Plants are furniſhed with theſe Vents or Wind-pipes, the Intention certainly muſt be to promote a Tranſpiration of Air; and if they breathe this Element like Animals, it muſt produce in them ſome of the Effects it accompliſhes in theſe. The Motion of the Blood and other Fluids, in living Creatures, ſeems to be effected by the Air, becauſe, when the Communication of this is intercepted, their Blood immediately grows thick and coagulates, and they die the Moment they are deprived of its beneficial Effects. This Element therefore is in all Probability the Principle of the Motion and Progreſs of Sap in Plants; and two Circumſtances concur to produce this Operation; one is the Elaſtic Power of the Air, or that Spring with which it expands itſelf, in Proportion to the Heat that penetrates its Parts, and the Dimenſions of the Place where it obtains more Freedom; the other is the Structure of theſe very Air-pipes, whoſe ſpiral Rings, as they are capable of Extenſion, Tumefaction and Enlargement, naturally put all that ſurrounds them in Motion.

The *Chevalier* muſt not be ſtartled at the word Elaſticity or Spring: It is known by Experience, that the Air ſhrinks and is compreſſed by the Cold, and is dilated and expanded into larger Dimenſions by Heat. The various Changes of the Seaſons make us ſufficiently ſenſible of theſe Effects, of which we may have a tolerable Idea, by comparing the Body of Air that ſurrounds us, to ſeveral Locks of Wool thrown together in a Heap: Preſs this Wool, and you will find it immediately ſhrink and contract itſelf under your Hand; but when it is left to itſelf, it ſwells and takes upmore room: It is the ſame with reſpect to the Air. The only Difference that can be thought of is this; the Fibres of Wool have but little Force, whereas the Particles of Air are actuated by ſuch a powerful Spring, that the Moment they are releaſed from their Confinement they expand themſelves with ſurprizing Violence, and frequently ſhatterwhatever oppoſes itſelf in their Way. Let us apply this Spring to Plants.

The Gardener opens and turns the Earth with his Spade or Plough; in this Earth a Multitude of airy Particles are lodged, and when, at the Return of Spring, and the firſt Heats, the Atmoſphere or Body of Air, which gravitated upon us by the Preſſure of the Cold, begins to rarefy and expand, and becomes ſubtilized by the Rays of the Sun, theſe returning Heats likewiſe communicate their Impreſſions to the Air in the Bowels of the Earth, upon which it begins to dilate in ſome degree, and endeavours to break from its Confinement; it acts upon, and ſtrongly preſſes the Matter that ſurrounds it, and forces into Motion all the Water, Salts, and Oil it meets with under the Earth: Theſe Elements, being thus worked into Activity, inſinuate themſelves into the little Orifices of the Seed, and flow through all the Pores of their Covering; the ſmall Veſſels that fill the Seed, being ſo many empty Bags, whoſe Mouths are always uncloſed, are eaſily repleniſhed in their Turn; and as they are open at each Extremity, the Sap paſſes from the firſt Tube to the ſecond, and ſo to the Reſt in Succeſſion; by which means it moiſtens them all, and, in leſs than the Space of twenty four Hours, arrives at the Pedicle or Root of the Bud, after a Paſſage through the hollow Branches, which are diſperſed from all Parts of the Lobes, and re-united in two different Parts of the Root: This Root, together with the Stem of the Plant in the Bud, and the ſeminal Leaves which cover that Stem, are likewiſe fill'd with hollow Veſſels, that drink in their Turn, and quickly improve their Growth, with what they receive from the Lobes. All theſe little Veſſels, being ſwelled in this Manner, gradually riſe and enlarge the Fibres they traverſe; theſe too have their Nouriſhment, and conſequently lengthen and ſwell. The Root continues to ſhoot out, and, in a few Days, arrives at the little Paſſage that opens in the Skins that enfold the Seed, and then receives the nutrimental Juices of the Earth, which flow into the Extremities of its Fibres. The Stem and Seminal Leaves, being enlarged and animated by the ſame Proceſs, and daily puſhed forward by new Juices, mount to the Surface of the Earth.——

The Direction of the Stem and Root.

Counteſs. With your Permiſſion, I muſt interrupt you here. When a Huſbandman ſows, he ſcatters his Corn at random, and a Gardener, in planting Peas or Beans, neither obſerves the top or bottom of the Seed. If this Seed is inverted, ſo that the Stem be at the Bottom, and the Root uppermoſt, by what means can this little Stem riſe into the Air? And who gives the Root to underſtand, that its Office is not to aſcend, but to ſink and continue in the Earth?

Prior. This however is the Conduct they always obſerve, and the Root itſelf, after it has ſprung upward a little when the Seed has been inverted, falls into a contrary Deflexion, and bends and ſinks downwards into the Ground. † The Stem, having penetrated to a ſmall Depth, always takes a different Turn, and at laſt riſes to the Surface of the Earth, and generally continues its Aſcent in a ſtraight Line, without bending either to one Side or the other, unleſs it be one of thoſe Plants whoſe Fibres are contorted and weak, of which Nature are thoſe that form the Vine, the Ivy, the Hop, and ſeveral others; in which Caſe, Nature has provided them with Tendrils, twiſting Sprigs, and other Conveniencies for faſtening on what comes in their Way, and ſupporting themſelves on a Prop: But, in general, the Root of a Plant ſhoots into the Earth, and the Stem riſes, and aſcends perpendicularly into the Air. This is certainly as it ſhould be: but the Difficulty is to account for their Efforts to diſengage themſelves from any Obſtacle to their appointed Progreſs. We do not imagine them capable either of Underſtanding or Choice. All theſe Tendencies, from which there are no Deviations, are, in my Opinion, naturally accompliſhed by an Impulſe of the Air. The Particles of this Element, which the firſt Heats begin to unfetter and diſengage, meeting, at the Bottom of cultivated Land, with all the Reſiſtance of an hard and untractable Maſs, turn their Activity on the ſoft Earth, and there cauſe all the Juices to riſe. The Sap, chaſed from its former Situation, eſcapes through all the Paſſages that are open to it, and either aſcending or flowing obliquely, through the Root and its capillary Branches, all theſe ſupple and pliant Fibres muſt unavoidably comply with this Impulſe, and gradually ſink into the Earth, whatever Track might be firſt taken by the Root. The Sap being put into Motion in the Stem, and puſhed on by that which ſucceeds, mounts upwards, and naturally draws to the ſame Quarter the Seminal Leaves; which, in forcing their Way upwards, through a few Inches of light and porous Earth, find not ſo much Obſtruction as they would meet with from the Earth below, and on each Side; and ſo true it is, that the Aſcent of the Sap forces the Root into a contrary Direction, that we have frequently ſeen Acorns, and other Seeds, even out of the Earth, ſhoot forth in moiſt Places, and for ſome time raiſe their Root upwards; after which they have by Degrees deflected it towards the Earth, from which it was then at a conſiderable Diſtance. The Root aſcended at firſt, becauſe, as the Seed was inverted, the Juices of the Lobes neceſſarily forced the Root upwards; but when it began to receive its nutrimental Juices immediately from the Vapour which aſcended from the Earth, this Vapour, in conſequence of its Tendency aloft, flowed into the Tube of the Root, and attracted it downward, to itſelf, by the Continuation of its Action. I one Day accidently left a few Grains of Corn upon my Standiſh; the Humidity of a Sponge, which was there wrapt round a little Veſſel of Water, made the Corn which was under it ſhoot out; the Root, when it had ſprouted forth a little, did not deſcend from the Side of the Standiſh, in order to continue its Progreſs to the Earth, but aſcended, between the Sponge and the Veſſel, towards the Aperture from whence the Water flowed into the Sponge, and at laſt reached the Fluid itſelf. Do you imagine this Root had any particular Inclination to that Part? No certainly; but the Vapour or Humidity which exhaled from the Sponge, and eſpecially from the Aperture of the Veſſel, in its Deſcent, flowing into the Root, raiſed it in a Direction contrary to the Deſcent of the Vapour, and attracted it to itſelf. If then the Root of a Plant ſhoots down into the Earth, it is owing to the Impulſe of the Sap, which produces this Effect.

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† Memoir. de l'Acad. 1700, 1701. Nieuwentyt, Grew.

Counteſs. This Explication is natural enough: but as yet I don't comprehend how you can aſcribe to the Impulſe of the Air, the upward Growth of the Stem, or that Diſpoſition in moſt Plants to raiſe and ſuſtain themſelves aloft, with that noble and majeſtic Air which adorns all Nature.

Prior. When the two Seminal Leaves are once ſhot into the open Air, the whole Affair is accompliſhed; if you ſtrip them from the Stem, the Plant will ſoon die; but if you permit them to grow, it will quickly riſe and aſcend in a ſtraight Line. It riſes ſoon, becauſe the external Air being introduced with the Fluidity of frequent Waterings, or with the Moiſture of the Night, through the Orifices of the little Air-pipes, that open on the Surface of the Seminal Leaves, dilates itſelf in the Plant, when warmed by the returning Sunſhine; it extends the Spiral Rings of the Air-Tubes, and preſſes all about it. Thoſe Particles of this Air which eſcape into the Lobes, complete the Preſſure of their Utricles, and drain them with their Juices to enrich the Stem. The other Particles that flow into the Root, cauſe the Sap to aſcend into the Body of the Plant, and are daily pouring it into new Veſſels: Theſe Veſſels ſwell and ſuſtain the Fibres, and, at the ſame Time, force them to aſcend. The Bark enlarges, the Leaves open, and Vigour reigns through the whole. With this Aſſiſtance of Air, the Stem not only riſes ſoon, but likewiſe aſcends in a ſtraight Line, becauſe the Impulſe of the Air, which flows into the Vents preſented to it by the little Stem, has a Tendency upwards; and as the external Air likewiſe encompaſſes all the Plant, and, in its Deſcent, equally inſinuates itſelf into all its Parts, equally dilates all its Air-Veſſels, and equally fortifies all its Fibres;

bres; no Reaſon can be aſſigned, why ſuch a Plant ſhould incline to one Side more than another, unleſs ſome foreign Accident intervene to bend it. The Lobes and Seminal Leaves begin now to be uſeleſs to the Plant; ſince its own Foliage provides more availing Supplies, by the Multitude of new Air Vents it unfolds, and through which the external Air, forcing into Motion that which it finds within, raiſes from the Roots a Quantity of new Juices that fill the Fibres, the Utricles and Pith, cauſing a vigorous Youth to ſucceed a delicate and feeble Infancy. The Juices which then aſcend in the Plant are too ſtrong to be admitted into the tender Fibres of the Seminal Leaves; they find freer Paſſages elſewhere, into which they flow. The ſmall Quantity of Sap remaining in the Utricles of theſe Seminal Leaves completes its Diſcharge into the Stem, or elſe evaporates without being recruited; by which means both the Seed and Seminal Leaves are exhauſted, and gradually wither, or rot away.

As the Plant is now no longer in its Infancy, let us examine in what Manner it receives its Nouriſhment.

Count. I am no longer in Pain, to diſcover the Principle of Motion in the nutrimental Juices, ſince the Air we breathe, by the Mediation of a ſingle Windpipe, and which is capable of imparting Motion to the Aliment, and Fludity to the Blood, enters through a Number of Canals, into the Bodies of Trees, and the very Depth of the Earth, where it deſcends, in order to find out and convey proper Nouriſhment to Plants; and it is eaſy to comprehend, how the Air, acted upon by the Sun's Heat, and expanding by its natural Spring, can puſh before it, and impel into the Apertures of the Roots, what Juices it meets with; but my great Difficulty is to know, how the Air and Heat are capable of conveying to each Plant the very Juices that peculiarly correſpond with its Nature.

Counteſs. This is what I was waiting to hear the Prior clear up. Theſe Plants are fixed in the Earth by as many Faſtenings as they have Roots, and cannot move one Step to provide for their Neceſſities. How can the heated Air then furniſh them preciſely with what they want? For each Species has its particular Inclination and Taſte. This muſt be ſupplied with acid, and that with ſofter Salts; one demands Milk, another muſt be nouriſhed with Oil: How then can they be all accommodated, without any Miſtake?

Prior. Should the Air indeed change its Operations, and convey a Flow of acid Juices to a Tree that requires Oil, a ſingle Kitchen Garden would diſguſt a number of People. But the Air and Heat have it only in Commiſſion to give Motion to all the Juices they find, and direct them to the Plants, who are then to chuſe for themſelves whatever they want.

Chevalier. How, Sir! have Plants then Diſcernment enough to ſingle out what is proper for them, and reject all that may prove injurious?

Prior. Diſcernment, Sir! You would not imagine to what a Degree of Nicety their Choice extends. But, to make you ſenſible of it, let us compare the Earth of a Kitchen-garden, impregnated with its different Juices, to a Veſſel in which Oil, Water, and Wine have been promiſcuouſly poured. Take three Linen Fillets, and ſteep the End of one in Water, the End of the ſecond in a few Drops of Oil, and that of the third in Wine; after which, dip theſe three Fillets into the Veſſel, in ſuch a Manner, that their moiſtened Extremities may plunge into the Liquor, and the Ends that are dry may be raiſed and brought over the Rim of the Veſſel, a little below the Surface of the Liquor; the Fillet, which was firſt ſteep'd in Water, will fill itſelf with that Fluid, and diſtil no other; that whoſe End was immerſed in Oil will evacuate Oil alone; and the other will redden by Degrees, and no Fluid but Wine will drip from it: They never vary in this Operation, and you will find ſomething in Plants that perfectly correſponds with this Proceeding. That Being who created them, and by whom they are ſupplied with all the Veſſels neceſſary to their Nouriſhment and Propagation, has not neglected to place, at the lower Extremity of theſe Veſſels, a Syſtem of Strainers, whoſe different Apertures eaſily admit certain Juices, and reject all others. The proper Veſſel ſeems, more eſpecially, to have been impregnated, towards its Extremity, with ſome Drops of the Liquor, which imparts a diſtinct Scent and Flaviour to the Fruits of every Plant; by which Means, the Fibres permit only Water and certain Salts to flow into their Orifices, and the proper Veſſel gives Admiſſion to nothing but Oils, perfectly conformable to the Nature of its own, whilſt all others will be

The Refinement of the Sap in Graft.

conſtantly excluded. By the very ſame Proceſs, the Sap of a wild Stock is refined, by its flowing into a good Branch grafted on it. This Sap meets with Strainers, or the Orifices of Tubes, too fine to give Admiſſion to its groſſer Particles, and conſequently none but the moſt delicate can paſs through: At the Entrance into the proper Veſſel, it arrives at a Syſtem of Glands, impregnated with a certain Oil: All the Particles of the Sap, that correſpond in Fineneſs with this Oil, are well received; the reſt flow in a different Track, and are diſtributed into Branches where they may prove more acceptable. And thus the ſame Tree is capable of producing Fruits, very different in their Natures and Qualities.

Chevalier. I am loſt in Aſtoniſhment, at the View of ſo much Simplicity and Prolificneſs, in the Works of the Deity.

Prior. We may conceive, at leaſt in ſome Degree, how Plants of a different Nature, may, in the ſame Earth, and without any Effort or Motion of their own, be ſupplied with Juices and Liquors neceſſary to their Welfare; and now, if poſſible, let us attempt to purſue theſe Fluids, in their Progreſs, and diſcover whether the Aſcent of the Sap, from the Root to the Branches, and its Return from the Branches to the Root, be a Fact or not, and in what Channel it flows.

I am much inclined to believe, that the Sap neither aſcends thro' the Pith nor the Bark: It cannot riſe through the Pith, becauſe this is unprovided with Veſſels proper to convey it upwards, and is only furniſhed with little Cavities to contain it. In ſhort, it is the common Reſervoir of the Sap, but not the Canal through which it flows. There is likewiſe as little Probability, that it ſhould mount through the Fibres of the Bark, becauſe the Sap which is found in the Bark of ſeveral Plants, as Cherry Trees for Inſtance, is tinctured with a very beautiful Red, a Quality not imparted to it by the Earth; and which, indeed, it cannot acquire any otherwiſe, than by the Intermixture of the Juices that deſcend from the Leaves and Fruits. It remains for us then to ſay, it aſcends thro' the Fibres of the Wood itſelf, in

The Uſe of the Fibres of the Wood.

in the Extremeties of its whole Circumference; and indeed theſe long Fibres, ſo proper for the Conveyance of Fluids, are the very Veſſels wherein we find the crude Sap without Colour or any other Quality, unleſs it be generally a very ſharp Acid. It refines in its Progreſs through the Tubes, which, in their Aſcent, contract themſelves into leſſer Dimenſions, and allow a Paſſage only to light Juices and Salts. The Sap flows into the Leaves, where it acquires its Perfection, becauſe a great Number of Air-vents, opening to the Sky on the upper Surface of the Leaf, are perpetually ſuppl'ed with humid and refreſhing Streams, together with new Acceſſions of Air, and new Particles of Nitre, Fire and ſalutary Spirits, which mingle with the Sap, and, after Subtilizing all its Parts, qualify it for Admiſſion into Flowers and Fruits.

The Uſe of the Leaves.

The firſt Uſe of the proper Veſſel.

The Origin of the Scent and Flavour of Fruits and Flowers.

It is likewiſe very credible, that the proper Veſſel, as it ſhoots its Branches into all the Leaves, Flowers and Fruits, diffuſes into them a certain Honey or Oil, that mingles its balſamic Particles with the Air, Salt and Water, from whence the Scent and Flavour of Fruits and Flowers evidently reſult. This Obſervation agrees very well with Experience: No Parts of the Tree are more oily and ſhining than the Leaves and Flowers; and the Conformity of Taſte between the Oil which moiſtens the Leaves, and the Fruit cover'd by their Expanſion, is very ſenſibly perceived in ſeveral Trees, particularly thoſe that bear the Walnut and the Peach. The Leaves have before-hand that agreeable Bitterneſs and Taſte, which they afterward communicate to the Fruit and Kernel they are to produce. The Sap, purified and perfumed in the Leaves, acquires a Delicacy ſufficient for its Admiſſion into the Pedicles, or Stems of the neareſt Flowers or Fruits; and this is the Track wherein, according to all Appearance, it flows; becauſe when Caterpillars, or other Accidents, have ſtripped the Trees of their Leaves in the Spring, the Fruits which began to be formed, wither away; certainly not for Want of Sap, the Mildneſs of that Seaſon furniſhing them with a ſufficient Quantity, but only for want of Sap prepared and accommodated to the Veſſels that compoſe theſe Fruits.

The Return of the Sap.

The Sap, whoſe Groſſneſs made it incapable of a Reception in the Capillary Veſſels of Leaves and Fruits, apparently diſcharges itſelf into the Bark.

That Sap, the Fineneſs of whoſe Juices gave it Admiſſion into the Leaves and Fruits, after it has paſſed through the Fibres, the Utricles and the Pith, divides itſelf into two Branches, one of which flows back thro' the Bark, and the other evaporates, by Tranſpiration, through the Epidermis, or external Bark.

The refined Sap, which flows back through the Bark, colours the groſſer Sap, which likewiſe repaſſes there and the Mixture of theſe two Fluids produces that admirable Effect in the Bark, which his Lordſhip made us acquainted with before; I mean the detaching and Nouriſhment of the laſt Round of Fibres in this Bark, in order to incorporate it into the Wood, and enlarge it with a new Circumference. But this is not the only Function of the Sap which deſcends into the Bark: Its fineſt Particles are received into the Utricles, and thoſe which are too groſs, are precipitated towards the Root, in order to be raiſed and filtred a-new.

The Juices which are received into the Utricles, flow, through the Fibres of the Wood, to the Pith, where they perform two Functions: Firſt, they refreſh and nouriſh the Wood through its whole Length; and then paſs from the Utricles, into the Tranſverſe Fibres that form the Knots; by which means, the Gems lodged there are impregnated with a Juice perfectly prepared and adapted to their delicate Structure; and if you top a Tree, the Utricles, as they then receive a greater Quantity of Sap, ſhoot out more Gems. This Progreſs which I aſcribe to the Sap, from the Bark to the Utricles and Pith, and from thence to the Fibres of the Knots, is exactly conformable to the Diſpoſition of the Veſſels; and the more probable, becauſe Plants which have many Gems, Flowers and Fruits, are likewiſe furniſhed with a large Quantity of Pith, as the Elder for Inſtance; and, on the contrary, thoſe that have but few or no Gems to nouriſh, are quite deſtitute of Pith; of this Sort are the Stalks of Beans and Corn.

As to the other Part of the refined Sap, which evaporates through the Epidermis, or fine Skin of the Leaves and Fruits, it only tranſpires in Proportion to the Openings of the Pores. A gentle Heat, qualified with ſoft and refreſhing Gales, keeps all the Juices of Plants in Action, and prevents an immoderate Evaporation: 'Tis this which preſerves the great Quantity of Sap they poſſeſs, both in Spring and the Cloſe of Summer. But the Heat is ſometimes ſo violent, and opens the Surface of the Leaves, and other Parts of the Plant, to ſuch a degree, that the Juice of the Utricles, which run horizontally to the Epidermis, ſoon flows out and diſſipates. The Utricles then loſe more Sap than is reſtored to them, and conſequently muſt ſhrink and flatten, like empty Bags; the Fibres, which they ſuſtain, languiſh and fade for Want of that Support, and you then ſee the Leaves and little Branches hang down as ready to wither. Whilſt the exceſſive Heats continue, the Tree thrives more by Night than in the Day, becauſe the Night recruits it with more Juices than the Day had evaporated.

The two Saps.

The ſecond Uſe of the proper Veſſel.

But, beſide the Freſhneſs and Humidity of the Night, Nature has prepared for this Evil another Remedy, which is always practicable, even in the ordinary Heats. The proper Veſſel, which contains a gummy Fluid peculiar to every Plant, is not only deſigned to complete the Sap and Flavour of Fruits, to perfume the Air with the moſt fragrant Odours, to paint the Flowers and Fruits with the amiable Glow we ſo much admire, to furniſh the Bees with the Syrup they extract, and to accommodate Mankind with ſalutary Oils of every Sort; beſides all theſe Effects, it has another Function; for it diffuſes over the Leaves a ſmall Quantity of its Oil, the light Flow of which, tho' it cannot prevent the violent Infuſion of Air into the Vent-Holes, is ſufficient to cover and cloſe up the other little Orifices of the Epidermis and Sap-Veſſels; and this preſerves the Juices from too great a Diſſipation.

Ever-greens.

From hence it apparently follows, that Plants abounding with this Oil, which in them is more viſcous and difficult to be evaporated, muſt be always green, ſuch as

Box, Laurel, Orange-trees, and eſpecially Pines, Firs, and Yews, which ſpread their Verdure in Regions expoſed to the ſevereſt Colds, and moſt neglected by the Sun. Theſe Trees are ſlow in their Growth, becauſe they admit leſs Air than others, but they retain better what they have received, becauſe the Oil of Roſin, with which they are impregnated, defends their outward Surface, and prevents Heats, Rains, and ſultry Winds from diſſipating their Juices, and impairing their Growth.

The Fall of the Leaves.

When the firſt returning Colds begin to contract the outward Surface of the Leaves, the Sap is then evaporated in a much leſſer Quantity than it was before, and as the Juices which ſtill continue to aſcend, thicken the Leaves; theſe are then carried away by Winds, and their own Weight, or at leaſt their Oils and other Fluids are gradually diſſipated, without being recruited; in Conſequence of which, the Foliage aſſumes a yellowiſh Hue, and is only a Complication of withered Veſſels, and dried Fibres. Winter at laſt benumbs all Nature, and her vegetable Works appear indolent and diſarrayed, till the returning Sun enlivens them anew, by reanimating the Air and Sap.

Count. There are two Points in your Suppoſition, which may be ſeparately conſidered: One is the Manner in which you repreſent the Circulation of the Sap; the other, the Cauſe to which you aſcribe it.

As to the firſt Particular, I am very inclinable to believe, that the Juices of the Earth, and thoſe of the Air, or the aerial Spirits, have an alternate Motion in Plants; and that the former aſcend, by Day, thro' the Wood and Bark, and the latter deſcend with the Sap, eſpecially in the Night, through the ſame Canals. But I confeſs there are ſeveral Experiments which ſeem to favour your Opinion.

If a circular Gaſh be opened in the Bark of an Olive Tree, it will produce, that Year, a double Quantity of Bloſſoms and Fruits; but all the Growth about the Wound will afterwards languiſh by Degrees, till it be quite dead. The Cauſe of both ſeems to be this: The Sap, being intercepted, in its returning Flow through the Tumour which is formed in the Wound, is, at firſt, plentifully diffuſed through the Branches, after which it thickens, and then continues in a conſtant State of Stagnation.

The Milk-Thiſtle.

I know ſome Plants, very tender and full of Milk, which afford Circumſtances that corroborate your Opinion: When you bind them very tight about the Middle of the Stem, you ſee by Degrees, all above the Ligament ſwell, and appear ready to burſt, which can only proceed from the milky Juice which riſes from the Root, through the Body of the Stem, towards the Top, and afterward deſcends along the Bark, and would continue its Progreſs to the Root, were it not ſtopp'd by the Binding, in the ſame manner as the Blood flows from the interior Veſſels or Arteries, through ſecret Ducts, into the exterior Veſſels called the Veins, and, from thence returns to the Heart, unleſs you obſtruct its Courſe by a Ligament; after which it increaſes in Quantity, and viſibly ſwells the Veſſels above the Binding.

Palm Wine.

'Tis well known, that the *Indians* by making an Inciſion at the Bottom of the Bark of their Palm or Date Trees, and inſerting a ſlender Reed, extract a very agreeable Liquor in great Plenty, which they call Palm-Wine; and which, in a few Days, changes to Vinegar. In my Judgment, we need only ſuppoſe the Return of the Sap through the Bark, to account for this Fact. How could the Sap, in riſing from the Earth through the Bark, as is commonly imagined, acquire that aromatic or vinous Flavour? It is much more natural to ſay, that this Sap, aſcends through the Fibres of the Wood; filtres and refines itſelf, to its Perfection, in the Leaves, and there mingles with the Liquor of the Veſſel proper and peculiar to the Palm-Tree; after which, that Part of the Juice which flows back from the Leaves, mixing itſelf in the Bark with the Fluid that aſcends from the Branches, produces a copious and agreeable Liquor. At the Expiration of a few Days, the volatile and pleaſant Juices which, in that Liquor, corrected the Acrimony of the Salts, and the bitter Flavour of the crude Sap, being evaporated, the *Indians* have then nothing but a groſs Sap, in which the Salts are unſheathed, and this makes their Vinegar.

As to the Cauſe of the Circulation, which you aſcribe to the Action of Heat, and the Spring of the Air, the Proofs are very numerous. Plants are ſo ſubject to the Impulſe of the Air, that they faithfully ſubmit to all its Variations: They die when they are deſtitute of its Supplies, they languiſh when they have but little; they are benumb'd when it is condenſed, and re-animated when it recovers its Vigour.

I lately made an Experiment, which is ſo favourable to your Opinion, that it would be Injuſtice to conceal it from you *. I ſow'd ſome Lettice Seed, in Earth expoſed to the Air; and at the ſame time ſow'd a few more of that Seed in Earth, which I placed in the Receiver of an Air-pump, and immediately drew out all the Air. The firſt Parcel of Seed ſprouted forth, and, in the Space of eight Days, ſhot up an Inch and a half high; but that in the Receiver did not ſpring up in the leaſt: I then let the Air in, and immediately every thing was in Motion, and, in leſs than eight Days, the Seed ſhot up to the Height of two Inches and more.

It is likewiſe owing to the Power of the Air, that the ſprouted Barley, which is brewed for my Servants, and uſually kept in a Cellar, turns and directs all its Shoots to the opening through which the Air flows. The Air, which enters at that Paſſage, ſtreams into the Pores of all the Grain, and turns them to that Quarter, which is a Confirmation of your Remarks on the Tendency of Plants.

The ſame Tendency is obſervable in all Plants laid in Cellars; for their Leaves are always directed to the Air Vent or the Door.

In a Word, ſo true it is, that Plants are only ſtrong or weak, in proportion to the Force or Imbecillity of the Air, which inſinuates itſelf into their Pores; that if you expoſe Succory, Cardoons, and Selery, in the open Air, they will be tinged with a very ſtrong Green, but the Flavour of their Juices will be too bitter; whereas if you bind them with a String, or lay them up in Bundles, as the Air then enters their Spiracles with Difficulty, it only operates upon ſuch weak Juices as correſpond with the

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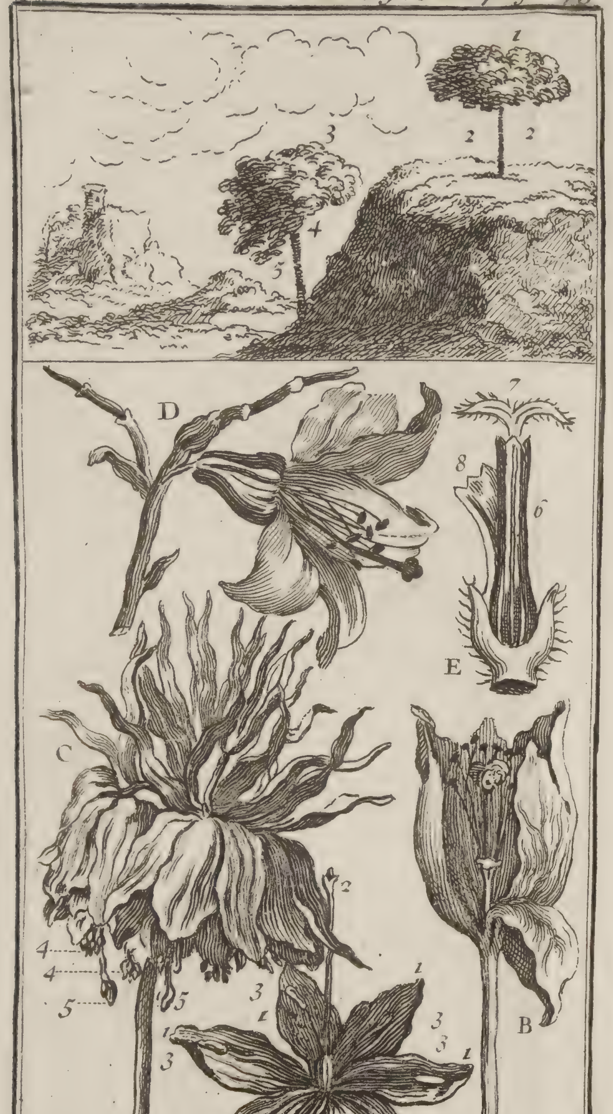
* Philoſoph. Tranſactions, n. 13. Lowthorp's Abridgment, Vol. II. p. 845.

Smalneſs

Plate 5 Vol. I page 273



A. Motte sculp

The different parts of Flowers

Smalneſs of the Fibres; in conſequence of which, all thoſe ſprouting Leaves you diſcover in the Inſide of theſe Bundles, advance but ſlowly, and, as they are incapable of enlarging their Fibres, they always preſerve an Air of Delicacy and Youth; every Part is tender, the Flavour agreeable, and the Colour extremely pale.

Chevalier. I have ſometimes asked our Gardener the Reaſon of this Fact; but he only anſwered, that it was his Buſineſs to tie the Succory into Bundles, and mine to find out the Cauſe of their whitiſh Complexion.

Why the lower Branches of Trees are parallel to the Earth on which they are planted.

Count. If the Air fortifies and unfolds Plants, in proportion as they are ſuſceptible of its Power, we have then the Solution of a Queſtion, which has frequently employed our Thoughts, though we could not come to any particular Determination. Look on that little Hill, *Chevalier*, it ends in a very level Plain, on which you obſerve a large Walnut-Tree, and another on the Slope of the Hill: Be pleaſed to take Notice, that the loweſt Branches of the Tree, which grows on the Plain, are exactly parallel to the Earth, over which they ſpread, and every where at an equal Diſtance from it. Obſerve likewiſe, that the loweſt Branches of the other Tree, on the Slant of the Hill, are equally diſtant from the Declivity; but the Tree, to acquire that Arrangement, has ſhot out a much greater Number of Branches towards the Bottom of the Hill than at the Top. You will conſtantly obſerve that the loweſt Spread of Branches, of thoſe Trees which are permitted to have their natural Growth, will correſpond with the Poſition of the Earth they cover; and deſcribe an oblique or horizontal Line, to preſerve, in every Part, an Equidiſtance from the Earth. If the Reaſon of this kind of Tendency be demanded, I think, it is to be diſcovered in the *Prior*'s Conjecture, and flows from it as a natural Conſequence.

The Trunk of the Walnut-Tree, on the Declivity of the Hill, forms an acute Angle with that Hill, towards the Top, and the ſame Trunk makes an obtuſe Angle with the Hill, toward the Bottom; or, in other Words, there is much leſs Space between the Tree and the Earth of the upper Part of the Hill, than between the ſame Tree and the Hill, toward the Bottom If therefore there be ſix Columns of Air between the Tree and the Earth, toward the Summit, or in the acute Angle, there will be nine or ten Columns, toward the Bottom, or in the obtuſe Angle: Now, where an equal Quantity of free and active Air is diffuſed, there very near an equal Growth of Branches will ſpread; and, on the contrary, where the Air has a ſtronger Impulſe, there a greater Number of Buds and Branches will ſpring forth. With reſpect to the Tree that grows on the level Plain, you ſee an equal Diſtance between each Side of the Top of the Trunk and the Earth; theſe are two right Angles: On both Sides there is an equal Impreſſion of Air, and conſequently you obſerve, both on the one and the other, almoſt an equal Quantity of Branches; and as thoſe on the right Side fill a Space equal to that on the left, the whole Baſe is therefore very near parallel to the Horizon, and almoſt equidiſtant from the Earth, in every Part. For the ſame Reaſon, if the Walnut-Tree on the Slope of the Hill, ſhoots forth ſix hundred Buds, on the upper Side, by Virtue of the Impulſe of ſix Columns of Air, it muſt neceſſarily unfold a thouſand Buds, on the lower Side by the Impreſſion of ten Columns: And this ſide undoubtedly producing more Buds, the Branches, which are their Offſpring, will poſſeſs more Space than thoſe above, and therefore, ſhooting into a proportionable Extent, they will approach as near to the Earth as thoſe on the upper Side; and, conſequently, 'tis altogether as natural for the Baſe of thoſe Branches that grow on a Slope, to correſpond with its Obliquity, as it is for the Baſe of ſuch Branches as grow on a Level, to be as even and horizontal as the Soil over which they are diffuſed.

Prior. The more ſimple the Conſequences are, and the more natural the Applications that reſult from our Conjecture, the eaſier it will be received. You ſee, *Chevalier*, two dead Trees at the Entrance into the Orchard: Perhaps what we have advanced, will enable us to gueſs at the Cauſe of their Diſtemper and Death. One is intirely covered with Moſs, which is a Plant that grows on Trees, and ſhoots out a prodigious Number of little Roots and Branches: The other Tree was killed by being buried under

The Effects of Moſs and Gum.

der the Ruins of a Wall which was afterwards rebuilt. But wherein can Moſs and Earth be injurious to Plants?

Chevalier. 'Tis evident that the little Roots and Branches of Moſs, by almoſt covering the Tree from Top to Bottom, have cloſed all the Air-Veſſels and conſequently rendered the Tree incapable of Reſpiration; and when the Air ceaſes to operate upon it, no more Sap can be expected.

Counteſs. 'Tis altogether as plain too, that if the ſuperfluous Juices tranſpire through the Bark, this Tree which has been thus buried, muſt be killed by the Stagnation of the Sap. Moſs likewiſe will occaſion the ſame injurious Effect.

Prior. If the little we know, of the Uſe and Correſpondence of the inward Parts of Plants, be ſufficient to fill us with Admiration, what will our Aſtoniſhment be, when we come to conſider their Fecundity! Their Roots, their Stem, all the ſmalleſt Branches, the Generality of their Flowers, their whole Syſtem of Seeds, are impregnated with Buds without Number. A ſingle Tree, a ſingle Branch, nay, a ſingle Seed, is ſufficient to communicate a Species to the whole Earth, through the Succeſſion of all Ages. This Fertility has the Air of a perfect Prodigy, and, if we ought to be affected at the Excellence of the Gifts we receive from the Deity, I think the Profuſion with which he beſtows them, ſhould give us the ſame Impreſſions. He has not only been pleaſed to grant us the Poſſeſſion of this or that beneficial Plant, but has likewiſe will'd and preordain'd, that Mankind ſhall never be deſtitute of them, whatever Accident may happen.

Counteſs. Not long ago, we had the Company of a Gentleman of excellent Underſtanding, who attempted to count the Seeds in one of the Branches of a young Elm, which had been planted twelve Years; and forming a Judgment of eight other principal Branches, by what he diſcovered in this; and computing the Produce of an hundred Years, by that of one, his Calculation amounted to Millions and Myriads of Millions of Seeds *. He likewiſe counted all the Buds that were viſible, and in a Condition to produce new Branches in one Year; and then adding them to thoſe that would be the Product of a Century, and at the ſame Time, including ſuch as at preſent remained, uſeleſs in every Part of the Tree, for want of the neceſſary Preparations for their ſprouting forth, he made a Computation perfectly ſtupendous, and very judiciouſly concluded that not only the Marks of Wiſdom and Power, but, if we may preſume on the Expreſſion, the Traces of Infinity itſelf were impreſſed on all the Works of the Deity.

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* Memoirs de l'Acad. des Scienc. M. Dodart. 1700. and Nieuwentyt Hiſt.

Prior. Theſe Truths are worthy our higheſt Admiration and Reverence. They aſtoniſh us, becauſe our Faculties are limited; but it is good to have an imperfect View of them, that we may be ſenſible of our own Inſufficiency; and where do we not meet with Opportunities for ſuch a Conviction? 'Tis not only the immenſe Number of Seeds in a Plant that confounds our Imagination; a ſingle Flower, even in its viſible Exterior, and which we behold opening in a Morning, and fading at Night, preſents us with the Traces of a Wiſdom, to which neither our Eyes nor Reaſon are capable of attaining. It was the Deity's expreſs Intention to overwhelm us with this Species of Infinity, that unfolds itſelf in all his Works, and even in the minuteſt Creatures, to keep our Underſtandings in Subjection to that Infinity which ſhines in his Eſſence, his Attributes, his Providence, his Operations and Myſteries.

Counteſs. It is very certain that a Flower, which ſeems ſuch a common Object, comprehends not only Beauties, but even Advantages and admirable Deſigns. I always conſidered a Flower as a Work in Miniature, created to entertain the Eye with amiable Colours, and ſometimes to refreſh the Smell with fragrant Exhalations, and that was the utmoſt of my Conception: But my Calculator ſurprized me exceedingly, when he acquainted me, that the Flower was not only the Sheath and Covering of the Fruit, but that even every Part of that Flower was neceſſary, in order to give the Fruit its Formation and Shape; and I ſhall never forget his * ingenious Explanation of all theſe Particulars. We Women, who have ſeldom the Advantages of any great Inſtruction, are ſometimes much more aſtoniſhed than your Sex at a new Diſcovery, and eaſily retain it, becauſe we are not ſubject to the Confuſion a Number of Sciences might occaſion.

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* Samuel Morland tranſact. phil. n. 287. Ray's Hiſt. of Plants. Memoir. de l'Acad. des Sc. M. Geoffroi, le Jeune, 1711.

There are ſome Flowers, ſaid the Gentleman of whom I am ſpeaking, that are furniſhed with a large and common Cup, ſuch for Inſtance, as Poppies and Carnations: There are others which have none, and theſe are Tulips, Anemonies, and ſeveral more. But all Flowers, or at leaſt the greateſt Number, have Petals, or Leaves, Piſtils, Tops, and Chives. The Leaves are a kind of a Paliſade, with which Nature has encompaſſed the Heart of the Flower, to cover it as there may be Occaſion. Theſe Flowers open at the Riſing of the Sun, to receive the Heat; and cloſe up, ſome more, others leſs, at the Approach of Rain or Night, to keep off Moiſture and Cold. For the moſt Part they form a little Vault, which incloſes the Seeds, and ſeems, with a kind of Conſciouſneſs, to preſerve the Grains conſigned to its Care *. The Petals perform the ſame Functions to the Flower as the Leaves render to the Plant; and all the Particles of Air, Water, and Fire, together with the active Salts and Spirits that operate in the Leaves, are inſinuated into their Subſtance, thro' the Pores that open on their Surfaces. The Seed is ſhut up in one or more Piſtils, which are ſo many little Purſes placed in the Centre of the Flower. The Chives are Fibres, or little Pillars, which riſe to the Height of the Piſtils, and ſuſtain the Tops; and theſe Tops are a kind of Pendants, or hollow Shells, filled with a fine Powder of the Nature of Roſin: When they are ripe, they let this Powder fall through different Strainers, into the Cup of the Flower, and particularly on the upper Part of the Piſtil, which is ſhagged with Points, and cover'd with a gummy Juice, as well as pierced with little Holes, that it may the better receive and detain the Powder. The Points and the Oil ſtop the Grains of this Powder, and the Openings facilitate its Paſſage to the Seed; but if theſe Paſſages, in the Piſtil, are too narrow to admit the Grains of Powder into their Va-

The Leaves of a Flower.

The Piſtil.

The Chives.

The Tops.

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* Perhaps they are the ſame to Fruits, as the ſeminal Leaves are to a young Plant.

cuity, we may then ſuppoſe, that theſe minute Grains conſtitute thoſe Incloſures which contain and evacuate a finer and more delicate Subſtance.

The minute Grains, or globular Particles of Wax, are fixed, perhaps, around the Piſtil, and at the Bottom of Flowers, while the Juices or Spirits with which theſe are impregnated, are transfuſed, thro' the Pores of the Piſtil, to the Grains, which then receive the imparted Fecundity. It is not yet known, whether the Power contains the Buds that are to be inſinuated into the Seed, or whether each Seed contains in itſelf one or more Buds, of which the neareſt to the Aperture of the little Purſe, is drenched and rendered prolific, by the enlivening Spirit that flows from the Powder. I ſhall be very cautious of taking any Part in the Diſputes of Botaniſts, and what we have already advanced on the Subject before us, amounts to no more than ſaying, that the Flower opens only to ripen the the Powder, and that this is the prolific Principle of the Seed.

If immoderate Rains in the Spring ſhould waſh away this Powder, no Produce can be expected. When the proper Seaſon for the Flower proves unequal, and either the Rain bears away the Powder, or the Cold ſhuts up the Orifices of the Caskets that contain the Seeds, few or none of theſe precious Particles enter into theſe Caskets or Piſtils, the greateſt Part of the Seeds continues barren, and the Product is inconſiderable. What I now tell you, is equally true with reſpect to the Bloſſoms of the Vine and Corn, as it is with regard to thoſe of Trees and the ſmalleſt Plants. But when the Seaſon proves favourable, and only a few Grains of the Powder well ripened ſhould fall into the Orifice of each particular Seed, theſe all become fruitful, and the Year is attended with Plenty. The other Grains of this Powder, which are innumerable, are not loſt, for they furniſh the Bees with their Wax, and a Number of Inſects reſort to them for their Food, or other Conveniencies unknown to us. But the *Chevalier* will have the beſt Idea of all theſe things in the Spring of the Year.

The Tulip.

In the Tulip, for Inſtance, which opens to the Sky, the Chives riſe higher than the

Piſtil, that the Tops may powder it, either by letting fall or ſuffering the Wind to blow their little Duſt upon it: On the contrary, with reſpect to the Imperial Lilly, whoſe Cup turns downwards; and the Common Lilly, and the Honey-ſuckle, whoſe Flowers bend extremely, ſhould the Piſtil be ſhorter than the Chives, 'tis evident that the Powder would fall from the Tops to the Earth, and be intirely uſeleſs to the Seed incloſed in the Piſtil; whereas, if the bent Piſtil be longer than the Chives, the Duſt, in that caſe, in its Deſcent from the Tops, will meet with Extremity of the Piſtil, and enter into it without any Difficulty; and this is Nature's Arrangement of the Flowers.

The Imperial Lilly. The Common Lilly. The Honey-ſuckle.

Chevalier. Here is a Turnſole, Madam, will your Ladyſhip oblige me with a Sight of the Particulars you have been deſcribing?

The Turnſole.

Counteſs. With a great deal of Pleaſure, Sir, Theſe large verdant Suns contain as many Piſtils as Seeds. Above each particular Seed a little Cup riſes, in the middle of which is a kind of Bag of a brown Colour, and full of a yellow Powder: Each of theſe Bags performs the Office of a Chive and Top to the Seed which is beneath. Thro' the Bag riſes a little Tube, whoſe Bottom joins to the Seed, and its Top is ſhagged with Hair, for the Preſervation of the Powder: This Tube likewiſe opens at the Top to receive the Powder, and ſplits into two Points: When it has performed its Office, the Points riſe and fold over one another; after which, they become dry and uſeleſs.

Some Plants are to be ſeen, in which the common Order of Vegetation is inverted; as particularly, that Plant whoſe Leaves are ſo prodigiouſly large, and which produces a very purgative Seed, called *Falſe Coffee*; if you pleaſe we will approach it.

Palma Chriſti.

The Piſtils are formed in Cluſters, on the Top of the Flowers, and the Packets of Powder are placed below. When theſe Packets are ripe, and burſt, a Steam of Powder riſes from them, and diffuſes itſelf thro' the Air. The little red Tufts, in which the Piſtils terminate, lengthen, in order to check the Fall of the Powder; by which means the Fruit, contained in the Piſtils, receives its Fecundity.

The Fig-Tree.

Some Plants have no other Flowers than thoſe of their own Fruit, as the Fig-Tree, where all the Kernels that are in the Fig are charged and accompanied with their Chives, their Tops, and their Powder, under a common Incloſure.

The Pompion. The Melon.

There are other Plants on which we diſcover two Sorts of Flowers, ſeparated on the ſame Stem, as Pompions and Melons. Gardeners give the Name of real Flowers, to thoſe which contain the Fruit, and call thoſe falſe, which incloſe their Powder in a Bag placed in the middle of the Flower, and out of which this Powder eſcapes thro' three or four remarkable Openings. The Gardeners generally pick off theſe pretended Flowers, which is a very good Method when their Produce is certain, and the Melons are compleatly formed, becauſe they husband the Sap by this Retrenchment; but they deceive themſelves extremely, when they deſtroy theſe falſe Flowers at their firſt Appearance, becauſe they contain the genial Powders, without which, the other Flowers that produce the Fruit are incapable of any Fertility; and we had once a Gardener, who, by an improper Officiouſneſs, in plucking off theſe falſe Flowers deprived us of all the Fruit.

The Gentleman from whom I had all theſe Particulars, gave me an Opportunity of obſerving, that ſeveral other Plants, as well as the Pompion, had two Sorts of Flowers on the ſame Stalk; and, during his Continuance here, made us ſenſible of the Truth of his Obſervations, which we found to be fact with reſpect to the Oak, the Filbert-Tree, the Ivy, the Mulberry and Plane-Trees.

He afterward informed us, that other Plants bore the Fruit-Flowers on one Stem, and the Flowers out of which the Piſtils ſpring, on another, of which Sort are the Palm-Tree, the Hop, and ſeveral others.

Chevalier. All that her Ladyſhip has related charms me with Admiration; but I find it difficult to comprehend how the Seeds ſhould be on one Stem, and the Flowers or Powder on another.

Counteſs. This is what I ſee daily, therefore don't be incredulous.

Plants Male and Female.

Chevalier. Why then do they make a Jeſt of thoſe People, who ſay Plants are Male and Female?

Counteſs. Let us take a Walk over the Bridge, to thoſe People who have been gathering Hemp; a ſingle Inſtance will evince to you the Reality of all the reſt. Here are two Sorts of Hemp expoſed to the Sun; in one of which you ſee the Flowers are dried, and it is that which has been gathered for ſome time; the other is ſtill green, and there you ſee ſeveral Bunches of Seed under the Leaves. The Stalk, which produced the Flower, was the talleſt at firſt, that the Powder which fell from the Flowers might be received by the Seeds, which were then lodged, much lower, on the other Species. The Flower-ſtems having performed their Functions, begin to wither, and they have been gathered and ſeparated from the others, to keep the People employed, 'till that Produce was compleated.

Chevalier. Madam, I acknowledge myſelf a Convert.

Counteſs. Pray let me know, which of theſe two Species you would call the Male, and which the Female?

Chevalier. I ſhould call the Male, that Growth which produces the Flowers, and is at preſent much ſhorter than then other, and dries firſt; and I ſhould give the Name of Female, to that which bears the Seeds; and ſurely this muſt be the Fact.

Counteſs. I find you would place Things in a right Order, and, give them their proper Names. But, for all this, the Country People have thought fit to give the Name of Female, to the Hemp which produces the Flowers, and is ſooneſt dry; and they call that the Male which bears the Seed, and for no other reaſon, but becauſe the Thread they ſpin from the firſt Growth is finer, and the other more compact and ſtrong. When you are in their Company, you muſt talk like them, or they will never underſtand you: But a Philoſopher, or, in other Words, the *Chevalier*, is at liberty to think differently from the Vulgar.

Chevalier. Your Ladyſhip will ſee what a Philoſopher I am: I have not the leaſt Knowledge of the Uſe of this Plant, and don't diſcover any Similitude between the Hemp in theſe Fields, and that which I have ſeen ſpun and work'd into Cloth: Will your Ladyſhip be pleaſed to explain this to me?

Counteſs. I invite theſe Gentlemen to entertain the *Chevalier*, to-morrow, with the moſt curious Plants of which they have any Knowledge; for, amongſt ſuch a vaſt number, they ought to fix on Particulars: And I dare ſay, they will ſearch all *Aſia* and *America*, for every thing ſingular and uncommon. For my Part, I don't intend to wander far from my own Garden, though I may happen to preſent you with ſomething more extraordinary than any Plants that are moſt celebrated by Foreigners, and it ſhall be nothing but Hemp: This I reſerve for my Subject, and our Converſation to-morrow will turn once more on Diſtaffs.

DIALOGUE XV.

The COUNT, *and* COUNTESS.
The PRIOR, *and*
The CHEVALIER.

Counteſs. CHEVALIER, it is not any Compliment, when I aſſure you that the ſudden Notice of your Departure gives me a real Concern. The new Alliance in your Family is a very advantageous Affair, and I am ſenſible it is abſolutely neceſſary for you to aſſiſt at the Ceremony; but I flatter myſelf with the Pleaſure of your Company, till the End of *September*, and now all our Schemes are diſconcerted: Adieu to Fiſhing, Hunting, and the new Academy.

Chevalier. The laſt Article gives me the greateſt Pain. One may be entertain'd with Hunting and Fiſhing in every Place, but I can no where enjoy ſuch Converſation as I am favoured with in this Place.

Count. Ah, *Chevalier!* we are indulging the ceremonious Strain. We muſt baniſh all that from our Academy.

Counteſs. Very well. Your Lordſhip makes Regulations, when the Academy is at an End.

Count. At an End! I rather take it to be only in its firſt Eſtabliſhment, and that our Aſſembly will be renewed every Year, in *September.* Is not this your Opinion, *Chevalier?*

Chevalier. I am only apprehenſive of one Inconvenience; and that is, I ſhall be wiſhing eleven Months for *September.*

Count. Your Diſpoſition is ſo well known to me, that I am perſuaded you will do every thing with Elegance and Taſte. That polite Literature to which you are going to devote your Attention, is all together as entertaining and uſeful as Natural Hiſtory, which, at preſent, is not ſo neceſſary for you to be inſtructed in; and I only recommend it, as an Amuſement to you in your Vacations. But whilſt we are in Expectation of your Return, the *Prior* and myſelf will sketch out the Subjects of our future Entertainments: I leave the Choice intirely to him, and we may very well depend on his Judgment.

Chevalier, How happy are we in the Country! and indeed we might be ſo in Town could we enjoy what is to be attained here.

Prior. Let us be more conformable to the Laws of our Society. No Compliments I entreat you. Academies, like ourſelves, never meet to admire one another. We come here to be entertained with what her Ladyſhip promiſed yeſterday.

Counteſs, You muſt allow the *Chevalier* to give you this Inſtance of his obliging Temper, ſince you are under no Neceſſity of being in much hurry for the Amuſement I promiſed you; for, in ſhort, it is nothing more than Thread and Hemp.

Prior. We don't think the Subject at all trivial: and whatever is uſeful to us, is more neceſſary to be known, than any thing that paſſes in *Jupiter* or the Moon. The moſt ſhining Speculations, and the Choice of Subjects intirely foreign to us, are not attended with the moſt profitable Conſequences: And I am better pleaſed with * Monſieur *Reaumur*, when he is contriving to deſtroy the Moths in our Tapeſtry, and the Vermin in our Houſes, with Oil of Turpentine, and the Fumes of Tobacco, than I am with Monſieur *Bernoulli*, wrapp'd up in his Algebra, or Monſieur *Leibnitz*, combining the Benefits and Inconveniencies of poſſible Worlds. Muſt we always be a thouſand Leagues from the reſt of our Fellow-creatures, in order to be rational and learned? For my Part, I think, on the contrary, that a Philoſopher cannot make his Studies too intelligible to Mankind, or employ himſelf in any thing better, than acquiring a right Apprehenſion of thoſe Objects that ſurround him, and in which he has any particular Intereſt.

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* Memoir de l'Acad. de Scienc 1728.

Flax, and Hemp.

Counteſs. It is diverting enough in the *Prior,* to rank me among the Philoſophers, and make what I have to ſay on Hemp, paſs for important Learning, when my Obſervations are taken from the Peaſants, who, in theſe Particulars, are our Maſters: However, I'll undertake the Province, but muſt deſire you to remember, this is the Philoſophy of a Vocation.

Flax may be ranked in the ſame Claſs with Hemp; and tho' it be much ſhorter, and abundantly finer, it is a Plant pretty much of the ſame Nature, and employed in more beautiful Manufactures. When the Hemp and Flax have been gathered, which is done by plucking them from the Earth, the Stalks are expoſed to the Sun, in order to ripen the Seeds, which are afterwards threſhed out of the Heads, and then the Stalks are tied up in Bundles, and ſteep'd in a ſtanding Water (the cleareſt is always the beſt): They are faſtened to Poles, and left to ſoak, about fifteen Days. When the Subſtance of the Stalks is almoſt rotten, the Bundles are taken out, and well dried. But, inſtead of ſteeping the Flax in a ſtanding Water, it is uſually expoſed to the moiſt Air of the Night, and the Heat of the Sun, alternately, by which it receives a finer Colour. When the Flax and Hemp are well penetrated, and afterward compleatly dried, they are bruiſed, by Handfuls, on a Block, with a kind of Mallet; all the Bullen, which is the inward Subſtance of the Stem, flies off in ſhivers, by the Force of the Blows, and nothing remains in the Hand of the Beater, but the thin Bark diſingaged in large Threads through the whole Length of the Stem. This Parcel of Threads is afterwards hung on a perpendicular Board, and bruiſed with a wooden Beetle, in order to ſhake out all the little Straws that may happen to remain in the Bullen. All the groſs Parts are now ſeparated from the Stem, and the Threads of the Bark, that remain in the Hand of the Manufacturer, are intirely pure, and receive their Perfection from the Comb; or, in other Words, they are drawn, firſt through large Cards or Iron Teeth, and afterwards through others that are finer, that they may be purified from whatever may be ſtill too thick and groſs. This Refuſe is what they call Tow, of which Matches for the Artillery are made, and likewiſe a thick Yarn for packing Cloths, whoſe Uſefulneſs is infinite, ſince they wrap up and preſerve the moſt valuable Commodities, in their Tranſportation from one Country to another.

When the Hemp has been thus prepared, it is tied up in Bundles, to be ſent to the Rope-yards; but if it prove fine, and fit for the Spinſter and Weaver, it is formed into Twiſts; and now we come, at laſt, to the Diſtaff and Spindle. You ſmile, Gentlemen, but I ſhall ſoon make you ſenſible of the Value of what you ſo much deſpiſe. Suppoſe, only for a Moment, that you were three *Americans*, three *Iroquois*, or, if you think fit, three *Chineſes*, no matter which, be ſo good as not to be offended at the Suppoſition. What would your Aſtoniſhment be, were I to inform you, that our *Europe* produces a little Plant, whoſe Fruit is an excellent Nouriſhment to ſeveral Birds; affords a kind of Bread good to fatten large Cattle, and produces an Oil that illuminates innumerable Families in the Night; that, inſtead of the Men, the *European* Women generally work off the Bark of this Plant, and manufacture it into thoſe ſpreading Sails, by the Aid of which our Ships tranſport their Merchandize to the remoteſt Parts of the World, and convey to us whatever we want; that the ſame Bark is worked into Cables, ſtrong enough to bear the Weight and Force of Anchors, and that Ropes, Pack-thread, and Girths are likewiſe made of its Materials; that all theſe are of conſtant and univerſal Uſe in Navigation, Commerce, Husbandry, and domeſtic Affairs; that, with this very Bark, Houſes are made to ſhelter our Soldiers; that it likewiſe affords us the fineſt Ornament for our Tables; that we alſo form it into a Dreſs, which accommodates us Day and Night; is perfectly neat and convenient, and contributes as much to the Health of our Bodies, as the *Bath* itſelf, to which it now ſucceeds, and from the Trouble and Preparation of which it intirely diſcharges us; in a Word, that this Bark, according to the different Forms given it by *Europeans* becomes the moſt ornamental Habit of Kings, and furniſhes the Husbandman and Shepherd with a decent Attire, at a very inconſiderable Expence; Theſe are the Benefits we receive from this Plant.

Well then, don't you Gentlemen of the new World believe us very happy in ours, to have Women who are ſo dextrous at the Spindle and Diſtaff, and are capable of faſhioning this precious Bark?

Three Sorts of Cotton Trees.

Prior. For my Part, Madam, I, in the Character of a good *Iroquois*, ſhall maintain the Honour of our *America.* You boaſt of your Hemp, and I allow it to be ſomething; but we have three Trees, that are, at leaſt as good as yours; one creeps on Earth, like a Vine; the ſecond is thick, like a buſhy Dwarf-Tree: and the third is as tall as an Oak: All the three, after they have produced very beautiful Flowers, are loaded with a Fruit as large as a Walnut, and whoſe outward Coat is intirely black. This Fruit, when it is fully ripe, opens and diſcovers a Down extremely white, and which is called Cotton. They ſeparate the Seeds from that, by a Mill, and then ſpin the Cotton, and prepare it for all Sorts of fine Works, ſuch as Stockings, Waiſtcoats, Quilts, Tapeſtry, Curtains, and Conveniencies of every kind. With this they likewiſe make Muſlin, and ſometimes mix the Cotton with Wool, ſometimes with Silk and Gold itſelf. After this Account, can your Ladyſhip ſtill deſpiſe our *America?*

Counteſs. I am very well pleaſed with it for producing your Cotton. But are you *Iroquois* the People who prepare it? I believe they are obliged to our Fingers for this.

The Aloe of China.

Count. Since the *Prior*, in the Quality of an *Iroquois*, has taken upon him to be an Advocate for Cotton, I intend, in the Character of a *Chineſe*, to make Cotton likewiſe the Claim of *Aſia*, where it is gathered, and where they manufacture it much better than in *Europe.* And I am alſo to boaſt of a Plant that is ſtill more admirable; I mean the Aloe of *China*, to which your Part of the World can produce nothing comparable. But our Aloe muſt not be confounded with that Plant * which bears long pointed Leaves, is ſo very ſlow in producing its Flowers, and from which they pretend to gather Silk, and which Plant is commonly one of the Ornaments of our Druggiſts Shops.

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* Diction. Savari. Pom. Hiſt. des Drogues.

Our Aloe is a Tree as tall as that which bears Olives, and of the ſame Shape; under its Bark it contains three Sorts of Wood; the firſt is black, ſolid and weighty; the ſecond is of a tawny Colour, and as light as rotten Wood; the third, which is at the Heart, has a very ſtrong but agreeable Odour.

The firſt is called *Eagle-wood,* and is very ſcarce; the ſecond, Wood of Calembouc; it is brought into *Europe*, and eſteemed there as an excellent Drug; it burns like Wax, and, when thrown into the Fire, diffuſes an aromatic Scent. The Heart, which is called Wood of Calambac, or Tambac, is more precious in the *Indies*, than Gold itſelf. It is uſed for perfuming Habits and Apartments, and is a Cordial in fainting and paralytic Fits. And in this Wood they likewiſe ſet ſome of the moſt precious Jewels of the *Indies*. Theſe are not the only Advantages of our Aloe: The Leaves of this Tree ſerve inſtead of Slates, for covering Houſes; they are alſo formed into the Shape of Diſhes and Plates, and when they have been well dried, may be uſed at Table. When they are ſtripped of their Nerves and Fibres betimes, theſe are manufactured into a Thread, uſed in the ſame manner as your Hemp. The Points which riſe on the Branches, ſerve for Nails, Darts, and Awls, with which laſt the *Indians* pierce their Ears, when they deſign to honour the Devil by ſome extraordinary Auſterities. If any Cavity be made in the Tree by cutting out the Buds, a ſweet and vinous Juice flows from the Wound in a prodigious Abundance; it proves a very pleaſant Liquor, and, after ſome Time, changes to an excellent Vinegar. The Wood of the Branches is good to eat, and has the Flavour of a candy'd Citron. The very Roots are likewiſe uſeful, and Ropes are frequently made of them. In a Word, a whole Family may be ſupplied with Food, a Habitation, and Rayment, by an Aloe.

Counteſs. I confeſs this is a very valuable Tree, and happy is the Perſon who can poſſeſs one. But Hiſtory tells us, there are but few of the Species. As to any other Particulars, take all the Aloes together, and join to them every *Cocoa*-tree in the *Indies*, of which ſuch Wonders are ſtill related, and the Whole will be nothing comparable to our Hemp; becauſe thoſe great Trees are a long time in coming to Perfection, and will not grow in every Soil; beſide which, they muſt be deſtroyed before they can be uſeful; whereas Hemp thrives in all Places; and as it is ſown and gathered every Year, is not only eſtimable for its excellent Qualities, but ſtill more, for that Abundance which nothing can equal, and which makes it the Delight of the Rich, and the ſureſt Relief to the Poor.

Prior. Let us fairly acknowledge, that her Ladyſhip, in chuſing a Plant the leaſt alluring to the Eye or Curioſity, has fixed upon that which, next to Corn, furniſhes Mankind with the greateſt Number of real Advantages and Accommodations.

Counteſs. Let us know, *Chevalier*, what Plant you declare for. You may chuſe one that is foreign, or keep to the Growth of your own Country, as you pleaſe. You Philoſophers are Natives of all Nations.

The Sugar Cane.

Chevalier. I ſhould be for the Plant that produces Sugar.

Ibid.

Counteſs. You are very much in the Right. This Plant, which we want, is the Riches of the Country where it grows, and furniſhes thoſe to whom it is imported, with a thouſand Advantages.

Chevalier. I ſhould be glad to know the Shape of the Plant, and in what manner the Sugar is extracted from it,

Counteſs. I freely acknowledge I know nothing of the Matter. Put this Queſtion to our *Americans* here, and they will entertain you with ſeveral Novelties about it.

Prior. Sugar is properly nothing more than the Salt found in the Juice or Pith of a Reed, cultivated in the *Eaſt-Indies*, and ſtill more in *America*. A Sugar-cane, when ſunk in a Furrow of Earth, ſhoots out from each of its Knots, another Cane, which, riſing to the Height of ſeven or eight Feet, produces a Cluſter of Leaves very like our Flags, and a Sprig terminating in a Tuft, almoſt like our common Reeds; ours are only uſeful, by being ſometimes formed into very pretty Diſtaffs: but the Sugar-cane is impregnated with a delicious Syrup. Theſe Tubes or Canes are bruiſed under the Beam of a Mill, by the Labour of thoſe unfortunate Slaves, whom Merchants, that call themſelves Chriſtians, buy, like Horſes or Oxen, at *Senegal,* and in the Kingdoms of *Guiney,* and *Angola.* The Juice, after this, is boiled ſucceſſively in five different Kettles, and by the various Changes it undergoes, the Syrup is ſeparated from the eſſential Salt it contains. It was formerly thought ſufficient to begin this Separation, and ſend the Sugar from the *Indies* to *Rouen*, *Orleans*, and other Places, to be compleated: But is now tranſmitted to us in Loaves, well purified and refined. This is the Origin of Sugar, which we make no Scruple to prefer to Honey, ſo much eſteemed by the Antients. We are no longer in Pain, at the Accidents that may render the Labours of Bees unſucceſsful. The vaſt Regions and Iſlands in the Heart of the torrid Zone, are annually covered with an Harveſt of Canes, out of which the Syrup is firſt extracted, and afterward that delicate Salt which is now ſo univerſally uſed either to preſerve what would not otherwiſe keep, or to ſeaſon what would either be inſipid without this Expedient, too poignant with our common Salt, or diſagreeable by its natural Bitterneſs.

Chevalier. I am ſtrangely ſurpriſed to hear of Salt in a Plant.

Prior. All Plants and Bodies have their Salts. When the Chymiſts make a Solution of a Body by Fire, they conſtantly find more or leſs Salts, in what remains after the Diſtillation. The Aſhes that fall from the Wood we burn, are nothing but the earthy Parts, and the Salt of the Plant which was thrown into the Fire.

Count. I beg we may have no more Talk of Salts and Chymiſtry till the next Year, and let us not ſo much as attempt an orderly Detail of Plants in particular: We may one Day take a curſory View of medicinal and aromatic Plants, as well as thoſe proper for making Drinks in daily Uſe: Let us employ the Moments that are left us this Day, in a ſlight Examination of thoſe which are moſt frequently ſpoken of, and from the Knowledge of which we may receive the greateſt Benefit.

Chevalier. I ſhould be glad never to have had any Occaſion to be acquainted with *Manna*, *Rhubarb*, *Ipecacuanha,* and *Quinquina,* but I know the Efficacy of theſe

Medicines, tho' I am ignorant of the Country from whence they come.

Manna.

Count. Manna is a Sugar, or Species of natural Honey, that flows from the Leaves of the Aſh-tree in *Calabria*, at the Southern Extremity of *Italy*. Theſe kinds of Fluxions are frequent *. The proper Veſſel ſupplies all Trees with this Fluid; but our *Linden* and *Poplar* Trees are all covered, eſpecially in the Spring, with a gummy Juice that tranſpires thro' the Pores of their ſprouting Leaves; it has a charming Odour, which ſeems, by its Agreeableneſs, to promiſe us ſomething advantageous; and perhaps, the Experience of it may one Day prompt us to uſe it. 'Tis an Opinion which begins to prevail, and cannot be too popular, that God has ſtored every Country with Remedies for the Diſtempers incident to it, and that we have a Multitude of Plants around us, that tender us their Services; and perhaps had we leſs Inattention and Impatience, we might have no occaſion to reſort to foreign Remedies, which are always dear, and often impaired by Age, as well as adulterated and converted into Poiſon, by the Avarice of the Merchants. But whilſt we are waiting for repeated Experiments and Diſcoveries, it muſt be allowed, that we have no better Remedies than thoſe the *Chevalier* has named, and their Succeſs in ſome Diſtempers is almoſt infallible.

Rhubarb.

Rhubarb is the Root of a ſmall Tree, that grows only in *Aſia*, and eſpecially in *Tartary*. That of *America*, which has been thought to be of the ſame Nature, has not been as yet ſufficiently proved.

Ipecacuanha.

Ipecacuanha is the Root of a Tree, to be found in no Country but *Braſil*.

Quinquina.

1706.

Quinquina is the Bark of a Tree that grows in *Peru*. In ſeveral Countries it is called *Jeſuits Bark*, becauſe we are indebted to thoſe Fathers for this precious Remedy. Sir ——— *Talbot*, an *Engliſh* Gentleman, has made it much more uſeful and common than it was formerly, by the manner in which he has taught us to prepare it.

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* Savari Dict.

They now begin to uſe the Bark of a Tree in *Cayenne*, called *Simarauba*, and we are * informed for certain, that it preſently ſuppreſſes the moſt inveterate *Dyſenteries.*

Theſe four Remedies, ſo efficacious, and juſtly eſteemed, are only the Roots and Barks of ſome particular Trees. After the proper Juice they are capable of containing, we can have no Conception of any thing more than a little Veſſels, Fibres, and Air-vents; or, in other Words, a Syſtem of Veſſels appointed for the Filtration or Paſſage of Juices extremly ſubtile. I am apt to ſuſpect, that theſe Barks and Roots, when reduced to Powder, and received into the Body, are only like a Number of little Sponges, whoſe Pores and Orifices are proportioned to the extraordinary Smalneſs of the Acids, which diſorder and afflict the Patient. Theſe Acids inſinuating, or rather ſheathing themſelves in the Sponges, opened wide enough for their Reception, and ſufficiently compact to retain them; the Acids, Sponges, and Indiſpoſition, are all carried off, and diſſipated by Degrees. This firſt Suſpicion, that ſeems to have ſome Probability, makes me entertain a ſecond, which is that we may find in our own Country, a Root or Bark, which would produce the ſame Effects.

Gentian.

Prior. The Root of our *Gentian* is no way inferior to the Jeſuit's Bark, in Intermitting Fevers: And be pleaſed to take Notice, I am ſtill ſpeaking of a Root.

Count. 'Tis to be hoped ſome future Experiments will diſcover to us our own Riches.

Counteſs. Gentlemen, you are treating Phyſic in a very rational manner; but there are Plants, whoſe Uſe and Efficacy are more agreeable: And I deſire to know from whence we have thoſe Drinks or Infuſions that are become ſo faſhionable, I mean *Tea*, *Coffee*, and *Chocolate*.

Tea.

Count. Tea is nothing more than the Leaf of a Tree, that grows only in *China*, and *Japan*. The Tea-Leaves, when ſteeped in warm Water, and corrected in their Bitterneſs, by a ſmall

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* Memoir. de l'Acad. des Scien. 1729. M. de Jeſſieu.

Quantity of Sugar, diffuſe the Scent of a Violet, and a Volatility which, in ſome meaſure, refreſhes the Brain, and beſides the Qualities, it has the Reputation of being an *Aperient*.

Coffee.

Coffee is a little Berry, gathered from a Tree in *Arabia Felix*, towards *Aden* and *Mocha*; and they now begin to cultivate it, with Succeſs, in the Parts adjacent to *Batavia*, and in the the Iſle of *Bourbon* near *Madagaſcar*, which belongs to the *French*.

Chocolate.

The Cocoa.

Chocolate, which is diluted in warm Water, in order to make a nouriſhing Liquor, is a Paſte whoſe chief Ingredient is the Powder of *Cocoa*-nuts, which are taken out of a long Shell, ſhaped like a Cucumber; and to theſe Nuts there is an additional Mixture of ſome particular Drugs. The * *Mexicans*, in whoſe Country the Cocoa-trees grow in the greateſt abundance, take the Nuts and mix them with *Indian* Corn, and ſuch Sugar as they extract from their Canes, adding a few Seeds of the *Rocou*, which are coloured with the fineſt *Vermilion* in the World. They grind all theſe Ingredients between a Couple of Stones, and work the Mixture into a Paſte, which they eat dry when they are hungry, and diſſolve it in warm Water, when they would quench their Thirſt.

The *Spaniards*, who find this Compoſition very beneficial and acceptable, and know it to be a Commodity of a ſure Conſumption, are ſo induſtrious to bring it to Perfection, and make it extremely valuable, that, at preſent, a ſmall Garden planted with *Cocoa*-trees, is worth above twenty thouſand Crowns to the Proprietor. Complaints are made, that *Spaniards* mix with the *Cocoa*-nuts, too great a Quantity of *Cloves* and *Cinamon*, beſide other Drugs without Number. The Grocers in *Paris* uſe few or none of theſe Ingredients, and have much leſs Regard for *Musk* and *Ambergreaſe*, which a Number of People are fond of to Infatuation; they only chuſe out the beſt Nuts, which are called *Carracca*, becauſe they are brought from the Parts adjoining to the City of *Carraccos* in *Terra Firma*; with theſe Nuts they mix a very ſmall Quantity of *Cinamon*, the freſheſt *Vanilla*, and the fineſt Sugar, but very ſeldom any *Cloves*; and they now have the Art of making ſuch Chocolate, as is univerſally eſteemed.

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* Savari.

Chevalier. I know nothing of the *Vanilla* his Lordſhip has mentioned; and am as much to ſeek with reſpect to *Cinamon* and *Cloves*.

Vanilla.

Count. *Vanilla* is a Shell full of a luſcious Juice, and little black Seeds of moſt agreeable Odour. It is gathered in *America*, and eſpecially *New Spain*, from a Tree of the ſame Name.

Cinamon.

Cinamon is the Bark of a Tree found only in the Iſland of *Ceylon*. The *Dutch* have deſtroyed it in every other Place, and monopolized the Commerce of it to themſelves. * When the Fruit of the *Cinamon* Tree is boiled in Water, it produces an Oil, which fixes and thickens like *Tallow*, in proportion as the Water cools: Of this Oil they make Candles perfectly white, and reſerve them for the King of *Ceylon*. There is alſo the white *Cinamon* of *St. Domingo* and the *Antilles*; but it this is little eſteemed.

The Clove.

The *Clove* is a ſmall aromatic Fruit, ſhaped like a Nail, with a Point and a Head divided into four Quarters. It grows on the *Clove* Tree, in the Iſland of *Ternate* †. This Tree was once very common in all the *Moluccoes*; and every Nation furniſhed themſelves with *Cloves* at Liberty. But the *Dutch*, whoſe Patience the greateſt Obſtacles could never weary, have either engaged or conſtrained the Natives of theſe Iſlands, to deſtroy all the *Clove* Trees, except thoſe in *Ternate*, where the *Dutch* are Maſters. They have likewiſe the beſt Settlements in thoſe Countries that produce *Pepper*, *Nutmegs*, and *Mace*; which laſt is the Shell of the *Nutmeg*, and much more eſteemed than the Nut itſelf: So that, by theſe means, the *Dutch* are become the Medium of this kind of Traffic, to almoſt all *Aſia* and *Europe*. And thus you ſee, in a few Words, the Origin of our faſhionable Infuſions and beſt Spices.

Counteſs. I am diſſatisfied with ſome Circumſtances in theſe *Indian* and *Turkiſh* Liquors, which prevail ſo much among us; one is, the Neceſſity of preparing them every Time you intend to uſe them: And the other is the Difficulty of preſerving the proper Ingredients of this Preparation. They all evaporate and loſe their Spirits, and we muſt be conſtantly renewing our Stock.

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* Journ des Scav. Jan. 11. 1684.

† A ſmall Iſland lying Weſtward of Gilolo in the Moluccoes.

Count. On the other hand, 'tis the Privilege of our beſt Liquors, to retain their Perfection many Years: *Burgundy* preſerves its Excellence even in *Perſia*, where *Tavernier* preſented ſome to the Sophy, who prefered it to his Wine of *Schiras*: *Champagne*, which Monſ. *St. Evremond*, who in Matters of Pleaſure was undoubtedly a good Judge, called the beſt Wine in the Univerſe, is preſerved in Bottles nine or ten Years, and even more, when it happens to be rightly managed.

Corn.

Prior. If our *European* Liquors keep longer than thoſe of *Aſia*, 'tis the very ſame with our Corn, compared either with the *Magnoc* Root, of which the *Americans* make their Bread, or the Pith of *Sago*, which ſerves for Bread, in all the *Moluccoes*, or indeed, with all the Plants, which the Natives of different Countries have endeavoured to ſubſtitute in the room of Bread. We ought to offer up our Gratitude to the Deity, for a Nouriſhment the moſt perfect in its Kind, and whoſe Production and Preſervation are moſt eaſily accompliſhed. When Corn is well managed, it may be kept an hundred Years and longer, if ſuch be the Intention.

Chevalier. An hundred Years! I have known Corn grow bad in leſs than three. What Method then muſt be taken to preſerve it?

Count. At firſt, it muſt be removed every * fifteen Days, for at leaſt ſix Months ſucceſſively, if you intend to preſerve it; after this, it muſt be removed once a Month, or not quite ſo often. They ſhift it from Place to Place with a Shovel, that the Duſt, Impurities, and heated Air may be diſperſed. When the Corn, by this Proceeding, has exhaled all its fiery Particles, it may be kept as long as you pleaſe, provided the Root of the Granary be of a reaſonable Height, and all Humidity excluded. But in order to fruſtrate all bad Impreſſions of the Air, and prevent the

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* Memoir. de l'Acad. des Scienc. 1708.

Entrance of Vermin, who grow as numerous as the Corn itſelf, and dig, each of them, an Habitation in every Grain, the moſt effectual Method is to ſpread a little unſlaked Lime over the Heap, and ſprinkle it lightly with Water; the Particles of Fire, incloſed in this calcined Stone, eſcape through the Apertures made by the Water; the Lime melts, and changes into a Jelly of a perfect Whiteneſs: It then inſinuates itſelf through the whole Surface of the Corn, two Fingers in Depth; and this Mixture of the Grains and Jelly forms a Cruſt, which prevents the Corn from taking Air, as well as over-heating and ſhooting forth.

Prior. In the Year 1707, they opened, in the Citadel of * *Mentz*, a Magazine of Corn which had been ſtored up in 1578, and the Bread that was made of it proved very good. When the *Abbé de Louvois* travelled to the Frontiers of *Champagne*, as he was one of the moſt judicious Men in the World, and indefatigable in his Endeavours to be informed of each Particular that related to the Arts and Sciences, he viſited all Parts, and had everywhere a favourable Admiſſion. They ſhewed him, in the Caſtle of *Sedan*, a Heap of Corn which had been lodged there an hundred and ten Years, and preſerved notwithſtanding the Humidity of the Place, which at firſt made it ſprout above a Foot deep. The Leaves, and firſt Shoots of the Stems, which had already riſen to the Height of a Foot, wanting Air, began to rot, and ſunk down upon their Roots; and this glutinous Compoſt, incorporating with the Grains beneath, and growing dry hardened into a very thick Cruſt, which preſerved the reſt of the Heap. Some of the Bread, made of this Corn, was ſent to Court and proved extraordinary good.

Chevalier. If this be the Caſe, we never need be apprehenſive of Famine. When the Harveſt is plentiful, a Quantity of Corn might be ſtored up, and then we ſhould not be obliged, in Years of Scarcity, to purchaſe it from foreign Countries, at an extravagant Price.

Count. This Precaution is taken by the *Dutch*, who have always a double Proviſion. But the Attempt might ſeem very great, for ſuch a Kingdom at *France*, tho', at the ſame time, it muſt be acknowledged, that were this Expence once made, it would ſecure the Indigent from inhanced Prices, and the Rich from Inſults; and, by keeping off a Famine, would preſerve us from the greateſt of all Calamities, becauſe it never fails to carry off one Part of the Inhabitants, and always expoſes the other to the Dangers of Sedition, and contagious Diſtempers.

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* Memoir. de l'Acad. des Scienc. 1708.

Prior. The Precaution you mention would not only prevent the Miſchief, but even diſſipate the Apprehenſions of it, which are ſometimes as terrible as the Calamity itſelf. Two or three Moons, unfavourable to the Fruits of the Earth, are alone ſufficient to ſhut up all the Granaries, and introduce a Famine, when there is even a real Plenty; and then the Diſorder and Alarms will be univerſal, and incapable of Mitigation or Controul, by the utmoſt of human Wiſdom; whereas one Magazine of Corn, wiſely raiſed and regulated, in every Canton of the Kingdom, would intirely prevent all theſe Diſaſters.

Count. Theſe plauſible Projects are eaſily formed, by ſuch ſpeculative People as ourſelves, who know nothing of the Neceſſities of State. The Affair has been frequently propoſed, always reliſhed, and as conſtantly obſtructed by ſeveral Accidents: For our Parts, we have only to expreſs our Wiſhes in this Particular; and as to the reſt, muſt repoſe our Confidence in the Wiſdom of the Government. Inſtead of regulating the State, let us adjuſt our Plants, from which we have made a little Digreſſion.

Counteſs. I adviſe you, Gentlemen, to keep to what has been ſaid: But to put the *Chevalier* into a Condition of knowing much more than he can learn from you, in the little time we are to be together, I will give him this good Counſel: After his Return to *Paris*, let him frequently make his Court to the Directors of the Royal Gardens; his Eyes and Ears will be conſtantly entertained with real Curioſities. Of all Employments, none is more ſimple, and natural to Mankind, or more amuſing than the Cultivation of Plants. For my part, I am ſo delighted with it, that I never paſs a Day, without walking round my Parterres, and Kitchen Garden; I have there daily Diſcoveries of ſome agreeable Novelty; both the Mind and Body equally find their Account in this Exerciſe; and, to inſpire the *Chevalier* with an Inclination to it, I muſt inform him, that the Culture of Plants is equally noble and entertaining: It has conſtantly had Charms for Kings, as well as Subjects; and 'tis now very common to ſee Men of the firſt Quality, in *England* and *France*, applying themſelves to Gardening and Husbandry, and the proper Methods of bringing both to Perfection.

An Enquiry whether the Moon has any Influence over Plants.

Prior. It is a known Fact, that, at preſent, the moſt polite and underſtanding People make their Garden, not only a Pleaſure, but a ſerious Affair. The Art of managing a Kitchen Garden eſpecially, was never carried to a greater Height; and we ſee ſome of theſe, where the Eyes are as much delighted with the Propriety of the Cultivation, as they are with the moſt regular Parterre, and where the Diſcovery of a thouſand new Secrets, for improving the Fertility of Plants, and perhaps making the Species more diverſify'd, muſt produce Pleaſures incomparably more entertaining than any that the regular Shape of Yew or Box-Trees formerly afforded. This Taſte does Honour to the preſent Age, and makes it evident, that we have not always a Contempt for what is ſolid, but can be rational in our very Pleaſures. I however wiſh the Cultivation of Plants were, like true Piety, freed from every vain Scruple, and diſencumber'd of each ſuperſtitious Practice. People are as much infatuated as ever, with the Influences of the Moon and Planets, over Husbandry and Gardening, and, with the greateſt Regularity, forbear either to plant or fell, in the Wane of the Moon. Deep Study has aſſigned particular Days for that Employment, and the Knowledgment of theſe diſagreeable Practices, frequently conſtitutes the whole Abilities of ſome impertinent Gardeners, though, at the ſame time, the Falſhood of thoſe pretended Rules is daily evinced by a thouſand Experiences, and the Gardeners, themſelves muſt needs be ſenſible of their Inſignificance: But when a Plant happens to ſucceed well, they congratulate themſelves, for having choſen a proper Day for its Plantation, and the Time of the Moon muſt be ſet down amongſt their Maxims; and whenever the ſame Plant, ſowed or planted by their Neighbour at a very different Time, thrives better than their own, they immediately impute this to the Soil, Air and Winds; in which indeed they are reaſonable enough; but then they ſtill retain their old idolatrous Reſpect for the Moon.

Count. You atone for the Offence you gave me a Moment or two ago, when you talked of Moons unfavourable to the Fruits of the Earth.

Prior. I ſpoke the uſual Language, but joined to it very different Ideas. As the Continuance of Winds, that operate ſo powerfully on the Productions of the Earth, and even our Bodies, is commodiouſly meaſured by the Duration of the *Phaſes*, or various Appearances of the Moon; and as we ſay the firſt Quarter has been rainy, and the ſecond hot, we are therefore apt to aſcribe that to the Moon, which, in reality, proceeds only from the Air.

Count. I lately was ſhewn the very ſame Remark, in a Letter written by Monſ. *Normand*, who has the Direction of the King's Fruit and Herb-Gardens; where it is aſſerted in expreſs Terms, which I ſtill remember, "That from "a vaſt Number of Experiments, made with the greateſt "Exactneſs, and in different Years, on all the Opera"tions of Gardening, he had never met with one that "favoured the Subjection of our Fathers to the different "Aſpects of the Moon." The Authority of ſuch a Man, who joins the politeſt Literature, and the juſteſt Taſte, to a moſt conſummate Experience, made a greater Impreſſion on me, than all the Harangues of a thouſand pretended Connoiſſeurs. It was the Opinion too of Monſ. *Quintnie* his Predeceſſor, that nothing was more frivolous, than to amuſe one's ſelf with obſerving the Day of the Moon, when we intended either to plant or fell; that in reality we ought to do every thing in its proper Seaſon, and chuſe a favourable Period, in the beſt Manner we are able, and then wait for the Succeſs; not from the Day we have choſen, but from the Operation of the Sun, and the Diſpoſitions of the Air and Atmoſphere.

Chevalier. Since the Influence of the Sun and Winds is ſo well known, why do People then ſo obſtinately aſcribe Effects to the Moon, whoſe Operations are imperceptible?

Prior. 'Tis an old Prepoſſeſſion, and a true Remainder of the antient Idolatry. The firſt Men who regulated the

Year after the Deluge, made uſe of a Method extremely commodious, and intelligible to all the World, in order to adjuſt the different Portions of the Year, and the Labours peculiar to each Seaſon. They choſe the various Appearances of the Moon; and as they always had Recourſe to this Planet, to fix the Time of their Labours, they began, by Degrees, to imagine that even theſe were influenced by it; and then, aſcribing new Efficacy to her, in proportion as ſhe approached to the Full, they at laſt became perſuaded, that what they ſowed, either in the Increaſe, or Full of the Moon, was impregnated with more Vigour; and, on the contrary, what they ſowed in the Wane, correſponded with the Moon's pretended Imbecillity. Crabs and Oyſters being frequently obſerved to be fat, and in a good Condition at the Full, gave them, as they imagined, an Opportunity of improving the Growth and Vigour of theſe Creatures into a Rule and Proverb, which a thouſand Experiments have ſince refuted to no Purpoſe. And as bad Winds ſometimes happen to blow in the Wane of the Moon, this Circumſtance was ſufficient to bring that Period into Diſreputation; for which Reaſon it continues to be unfavourably thought of to this Day.

Count. But what do you ſay of the Stars; and why were they imagined to have ſo much Force and Influence over us, that ſeveral People even now aſcribe to them, all the Good and Evil which fall to our Lot?

Prior. This has been occaſioned by much ſuch another Miſtake as the former. The various Situations of the Sun, who is placed, ſometimes in one Conſtellation, ſometimes in another, have induced People to impute to thoſe very Conſtellations, any exceſſive Heats, Rain or Winds, that happened under theſe different Aſpects. They afterwards proceeded to ſearch for the very Original and Fate of every natural Tranſaction in the different Situations of the Plants, and the Aſpect of ſuch and ſuch a particular Star: And this it is which has ſwelled the Works of the Antients, and eſpecially thoſe relating to Agriculture, with ſo many uſeleſs Obſervations and falſe Maxims. The *Georgics* of *Virgil*, which we may call the moſt compleat Piece remaining of Pagan Antiquity, are disfigured by an hundred frivolous Remarks on the good or bad Qualities of ſome particular Days of the Week or Moon, and on the Variations of the Air; which the Poet boldly aſcribes, ſometimes to the Aſpect of the *Dog-Star*, ſometimes to the Setting of the *Pleiades*, or the Riſing of *Orion* or the *Kids*; tho' the contrary frequently happened, as it does now. The beſt Excuſe in his Favour is, that 'tis impoſſible to expreſs in finer Modulations of Verſe, thoſe falſe but popular Ideas to which he was enſlaved by Education.

Chevalier. Since we are got among the celeſtial Animals, who have been thought to act ſo powerfully on thoſe Plants and Animals that cover the Earth, permit me to aſk you, why the Names and Figures of Animals were aſcribed to the Stars? What is the Origin of the *Ram*, the *Bull*, and all the reſt I have ſeen in the *Zodiac?* I have been told their Names and Situations, but was never inſtructed in the Reaſon of theſe things, which I always thought extraordinary, tho' I daily hear them mentioned.

Prior. 'Tis not eaſy to give you full Satisfaction, with reſpect to this odd Language, which ſeems to have been introduced among Men, from the eldeſt Antiquity. Some Diſtinction muſt however be made, and we are not to form the ſame Judgment of the Names of the Twelve Signs of the *Zodiac*, as we do of the other Conſtellations of the *Sphere*. The Learned are of Opinion, that the *Egyptians* gave to the Twelve Signs, the Names of as many different Animals; and this they did, according to their Cuſtom of diſguiſing remarkable things, under the Symbol or Form of ſome Animal, or known Object that had any Relation to the thing concealed: For Inſtance, I am very much tempted to believe, they repreſented God and his Attributes; ſuch as his Immenſity, and Omnipotence, his Fecundity, and Purity, under the Symbol of the Sun; and that they repreſented Nature, or Matter, which is intirely dependent on the Deity, and perpetually diverſified, under the Image of the Moon, which derives its Light from the Sun, and conſtantly varies its Appearance; and this perhaps might be one of the principal Cauſes of Idolatry; Men, by degrees, growing forgetful of God, and confining their Attention to the

The Vanity of Judicial Aſtrology, and the Origin of the Zodiac.

Sun, or even conſidering it as his Repreſentative. But, however the Fact may be, it is certain, the *Egyptians* were extremely devoted to *Hieroglyphics*, and the Twelve Portions of the *Zodiac* were always called by the Name of different Animals, intirely conformable to the *Egyptian* Method and Taſte; and they are capable of ſome reaſonable Explications. But for the Generality of the other Stars of the Sphere, *Greece*, in mere Fancy, aſſigned Names to them, but for what Reaſons, we muſt not attempt to diſcover. The *Greeks* imitated the *Egyptians*, in giving Names of Men or Animals to the Stars; with this Difference, that the old *Egyptians* gave ſymbolical Names to ſome Stars, on Account of a certain Conformity between the Symbol and the Conſtellation, whereas the *Grecians*, who were unacquainted with this Similitude, and ſtruck with Admiration at the Oriental Wiſdom, though, at the ſame time, they had a depraved Taſte for Fable; invented a hundred wretched Conceits concerning the Origin of the Animals of the *Zodiac*, and applied to the other Stars, the Names of Heroes and Animals moſt known in their ridiculous Metamorphoſes.

Chevalier. Let us leave the *Greeks* with their Fables: but what Reaſons could the *Egyptians* have, for calling one Set of Stars the Crab, another the Lion, the Virgin, or the Fiſhes?

Prior. The old *Egyptians*, after they had obſerved the four natural Portions of the Year, ſaw that the Sun, in each of thoſe Seaſons, was placed, ſucceſſively, under different Stars. For the greater Exactneſs then, and to parcel out the Year in a commodious and invariable manner, they divided each of the four Seaſons by three Cantons of different Stars; and the whole Year into twelve Houſes, or Stations of the Sun, to which they gave the Names of twelve Animals, who were relative to what paſſed on Earth, in every one of thoſe Portions of the Year.

The Sun, in Spring, covers the Earth with Bleſſings; and thoſe which the Antients were moſt deſirous of obtaining, and for which they had the greateſt Regard, were Sheep, Kine, and Goats. To adumbrate the Benefits and Fecundity reſtored to them by the Spring, they gave to the three Conſtellations, through which the Sun took his Progreſs in that Seaſon, the Names of theſe three Animals. The firſt Conſtellation under which the Sun is diſcovered at the Cloſe of Winter, when the Days and Nights are equal, had the Title of the firſt Animal who is commonly born at that Period, I mean the Lamb, or the Parent of that Creature, who is the Ram. To the ſecond, they gave the Name of the Bull: And as the Goats, who are hot in *November*, and pregnant for the Space of five Months, bring forth, at the Expiration of that time, two young ones, for the Generality, they aſſigned to this third Conſtellation of the Spring, the Name of the Twins, or Kids, inſtead of which the *Greeks*, without the leaſt Reaſon, have ſubſtituted the two Brothers *Caſtor* and *Pollux*.

Aries, or the Ram. Taurus, or the Bull.

Gemini, or the Twins.

When the Sun is arrived at the Summer Solſtice, he diſcontinues his Progreſs towards the Pole, and returns with a retrograde Motion to the Equator; for which Reaſon, the *Egyptians*, thought fit to appropriate the Name of the Crab to the Stars under which he then appears; every one knows the March of this Animal, and nothing could more properly intimate the Retrogradation of the Sun. The exceſſive Heats that follow, cauſe that Luminary to be then thought in his full Vigour, which they delineated, by giving the Conſtellation under which he then moves, the Name of the Lion, the moſt formidable of all Animals. The Harveſt which immediately ſucceeds, made the ſixth Conſtellation be characterized by the Figure of a young Female Reaper, bearing an Ear of Corn. The Symbol is taken from thoſe young Damſels, who gained their Living by gleaning after the Reapers; and nothing could better mark out that Seaſon of the Year, when Providence ſupplies the Rich and Poor with their neceſſary Proviſions. The *Chevalier* will be pleaſed to take notice, that the Ear of Corn which ſhe has in her Hand, is called *Shibboleth* in the *Hebrew* Language, and in the *Arabic*, *Sibbul* or *Sibbula* —— *Hebrew* and *Arabic!* What Converſation is this? Let us defer it to the next Year,

Cancer, or the Crab.

Leo, or the Lion.

Virgo, or the Virgin, or Ear of Corn.

Counteſs. I muſt intreat you, Sir, to proceed, you are a going to diſcover us the Origin of the *Sibyls,* and I have as much Curioſity as another Perſon.

Prior. The Name of the Ear of Corn, or *Sibyl,* was given to the Virgin herſelf who carried it, and nothing can be more ſimple than this Name, in its Original. But Fables afterward came into Faſhion, and a Hiſtory was formed out of what was only deſigned for a Symbol. It was pretended, that this *Sibyl* had been conveyed from the Earth into Heaven; and to qualify her for the Journey, they furniſhed her with Wings, in the Figures by which they repreſented her, and did not forget to affirm, that the Spirit of God was infuſed into her, and that ſhe foretold Years of Plenty and Sterility. From hence came the *Erythræan Sibyl;* and the Hiſtory of thoſe of *Perſia* and *Cuma* was caſt in the ſame Mould. All thoſe Women or Prieſteſſes, who took upon them to divine or collect Prophecies, as well thoſe that were antient and true, as ſuch that were modern and falſe, became ſo many *Sibyls:* But we have dwelt too long on this Subject, let us return to our Conſtellations.

Libra, or the Balance.

Scorpio, or the Scorpion.

Sagittarius, or the Archer.

Capricorn, or the Goat.

That under which the Equinox, which equals Day and Night, happens, could not be expreſſed by any thing better than the Idea of a Balance in *Equilibrio.* The Diſtempers cauſed by the Sun in his Retreat, or which break out at the middle of Autumn, gave the next Set of Stars the Name of the *Scorpion,* becauſe this Animal bears a Sting and a Bag of Poiſon in the Tail, and uſes both in his Flight. The *Sagittary,* or Archer, who comes next, has a Relation to Hunting, which is a Diverſion chiefly followed after the Fall of the Leaf. The *Greeks,* inſtead of a Hunter, have ſubſtituted the fabulous Idea of a *Centaur.* As the Crab, who marches backward, repreſented the Summer Solſtice, after which the Sun always returns to the Equator; ſo, on the contrary, in order to deſcribe the Winter Solſtice, after which the Sun aſcends, and continues mounting to the other Tropic, the Name of the Goat or *Capricorn* was choſen, becauſe theſe Animals generally climb when they are feeding, and, as they aſcend, always continue browzing, till they have gain'd the Summit of Rocks and Mountains. The Water-Pot may very well repreſent Rains and Snows, and the melancholy Seaſon of Winter; and laſtly the two Fiſh, which are united by a Band, ſeem to relate to the Generation of thoſe Animals, who appear about the End of Winter, at which Seaſon the Fiſhery begins to be good.

Aquaries, or the Water-Pot. Piices, or the Fiſh.

Pardon the Liberty with which I have offered you my Conjectures. I am ſenſible all of them are not equally ſatisfactory.

Count. Your Explications have an Air of Probability, and though they ſhould not happen to be all equally happy, 'tis ſufficient there are ſome which are natural and agreeable to Reaſon, and capable of making us comprehend, that ſome ſuch Conformities as theſe, gave the Antients an Opportunity of naming the Twelve Signs of the Zodiac in the manner they have done, which, at one Stroke, ſaps all the Foundations of judicial Aſtrology, and the ſuperſtitious Practices in Husbandry.

Chevalier. I am going to add all this to the Memorandums I have taken of our paſt Converſations, and ſhall beg the Favour of the *Prior* to reviſe the Whole, this Afternoon and To-morrow, before my Departure; for I intend to communicate to my Friends all I have learned here.

Counteſs. *Chevalier*, if you will oblige us with your Company the next Vacation, I promiſe you a ſecond Volume, if the *Prior* and his Lordſhip will be my Sureties.

A
LETTER
FROM THE
Chevalier DU BREUIL,
TO
Monſ. the Prior DE JONVAL.

SIR,

I Have been this Moment been writing to the *Count* and *Counteſs* of *Jonval*, to expreſs a thouſand Acknowledgments to them for the obliging Reception they gave me, and principally for their charming Converſations; and now permit me, my dear *Prior*, to teſtify my perfect Gratitude to you. The moſt delightful Days of my Life were thoſe I lately paſſed in your Company. You have led me into another World, altogether inchanting. Till then, I beheld all Objects like a Child, but you have taught me to ſee with my own Eyes, to know whatever is made for me, and to enjoy my due Prerogative. I have imparted the Pleaſures of my Vacation to my Brother and his young Spouſe. All our Family begin to be Philoſophers, and every Thing engages our Attention. We have a great deal to ſay, on whatever is preſented to us in our Walks, or ſerved up at Table. The Shell of an Oyſter, or the

Coat of a Nut, employs us for ſeveral Hours. We are endeavouring to diſcover the Original, the Structure and Uſe of every Thing we ſee. But we had yeſterday a Diſpute on this Subject with our Neighbour the Colonel, and I muſt now acquaint you with the Particulars. He pretended, that our Application to Natural Hiſtory, was only loſt Time, and all our Knowledge a Set of Miſapprehenſions and Uncertainties; that we might have a tolerable Idea, for Inſtance, of ſome of the larger Veſſels which contribute to the Nouriſhment of an Animal's Body, but that we could never diſtinguiſh the other Veſſels neceſſary to ſupport thoſe, and, much leſs, diſcover the Texture of the ſmalleſt; and yet, according to him, the Knowledge of the one was inſignificant, without an Acquaintance with the other; and therefore, that it was of no conſequence to begin a Work, and enter into a Track of Inquiries, when we were very ſenſible we ſhould never complete our Deſign. Tho' the Colonel's Diſcourſe had no great Authority with us, I was willing however to hear my Brother refute ſuch a Train of Reaſoning, and deſired him to tell me, if it made any Impreſſion upon him, and whether he imagined he had loſt an Object, that a little Miſt had render'd obſcure to us: I added, with a Smile, that the firſt Year I was at *Paris*, I had a Proſpect, from my Apartment, of the Dome of the *Invalids*, and that when there happened to be any Fog, I could not imagine what became of the Dome, and fancied it was no longer in being, becauſe I could not diſcover it at that time. My Brother, warmed with my Compariſon, renewed the Diſpute, and maintained, againſt the Colonel, that theſe Difficulties neither deſtroy'd the Certainty of what we already knew, nor the Facility of acquiring additional Informations; that indeed, ſome things were concealed from us, but they did not, for all that, prevent others from being ſufficiently evident and certain, and that we were not to exerciſe ourſelves in Inquiries that ſurpaſs our Faculties, but in thoſe adapted to our Capacity.

This Anſwer, which was judged to be very judicious, is the ſame, my dear *Prior*, which I heard from you, in a Converſation wherein you intimated the Rights and Limits of Reaſon. I was exceedingly affected with all you were then pleaſed to tell us, and ſhould eſteem myſelf extremely obliged to you, if you would give yourſelf the Trouble to write down the ſame Particulars, and tranſmit them to me at a convenient Opportunity. You have already taught me to think, and muſt now inſtruct me to think juſtly. My Brother, who has ſeen my Letter, and made ſome Additions to it, eſpecially in what relates to himſelf, pays you a thouſand Reſpects, and joins his Intreaties with mine, that we may be indebted to you, for an Illuſtration of the Subject I have propoſed to you.

We have no Intention to make the Colonel a Convert; ſince we ſhould only find our Labour ineffectual; but we are deſirous of being preſerved from his Miſapprehenſions.

A
LETTER
FROM THE
Prior DE JONVAL,
TO THE
Chevalier DU BREUIL,
On the Extent and Bounds of REASON.

SIR,

IT is no longer neceſſary to inſpire you with a favourable Idea of the Advantages reſulting from the Arts and Sciences, in order to excite your Curioſity: That Affair is already completed, and I am ſenſible, the Deſire of Knowledge is, at preſent, your moſt prevailing Paſſion: But then this Paſſion, ſo commendable in itſelf, and ſo fertile in its happy Conſequences, when it happens to be well regulated, may, like ſeveral others, be indulged to an immoderate Degree. We ſee ſome Perſons, who, inſtead of acquiring Solidity, are only elated by Knowledge; and there are learned Men, of whom it may be juſtly ſaid, that it had been better for themſelves and others, had they continued in their original Ignorance, and not abuſed their Attainments, by perverting the Uſe of Reaſon in the manner they are ſeen to practiſe.

Curioſity is, without Diſpute, a laudable Qualification; and no reaſonable Perſon will contradict that Truth: But ſtill this Curioſity muſt be conducted with Moderation, and we ought to be acquainted with its Limits, in order to confine it within their Circumſcription: And this is the Subject, which, in Obedience to your Requeſt, I now propoſe to examine. This Eſſay, my dear *Chevalier*, may ſeem to you a little abſtracted, and not ſo intelligible as our former Converſations. But let me adviſe you, at your firſt reading what I have now to offer, to conſider it only as a Hiſtory, without giving yourſelf any great Perplexity to comprehend every Particular. At the ſecond reading, you will find it more familiar; at leaſt the worſt that can happen, will be for you to place this Letter at the End of the Journal of our Converſations, after you have communicated it to your Brother, and to defer reading it anew, till you have made ſome farther Advances in Philoſophy.

The Bounds of Reaſon.

The Bounds of Curioſity are undoubtedly the ſame with thoſe preſcribed to the Reaſon of Man in general, and to the State of each Individual; but, for want of knowing the Meaſure and Intention of our Reaſon, we frequently deceive ourſelves, in the Choice of Things we deſire to know, as well as in the Degree of Perſpicuity to which we would willingly extend our Knowledge. It is, however, of infinite Importance to us, not to entertain wrong Apprehenſions on this Occaſion, and to make a juſt Eſtimate of the Power and Incapacity of Reaſon. The Knowledge of what this Faculty can accompliſh, may animate our Endeavours; and our Perſuaſion of its Inability, in other Inſtances, may ſave us the pains of many unprofitable Attempts. But it is a common Misfortune, and eſpecially among young Perſons, either not to be ſufficiently ſenſible of the juſt Value and Prerogatives of Reaſon, or elſe to entertain too advantageous an Idea of its Power; in conſequence of which, they either totally neglect it, or endeavour to extend it beyond its Limits.

We are, in this Age, ſurrounded with Dangers. The Fickleneſs of Conſtitution; the Conſtraint of Attention; the enchanting Aſpect of Pleaſures; the ſeducing Power of Example, a thouſand Cauſes may degrade Reaſon in our Opinion, and deprive us of the Efficacy of that Privilege which conſtitutes the Glory and Happineſs of Man On the other hand, the Deſire of improving our Underſtandings, the amiable Succeſs of ſome learned Men; the Honours and Advantages that attend the Sciences; the Pleaſure inſeparable from Study; our proper Talents, as well as our inconſiderate Complaiſance to ourſelves, when we are unacquainted with the Bounds of thoſe Faculties, may lead us into preſumptuous Inquiries, that either bewilder us by degrees, or tend to excite in us criminal Expoſtulations on the Infirmity of our Nature.

The Learned themſelves, to whom we confidently apply, as our Guides, in a Track they ought to know better than ourſelves, may be the firſt who contribute to our Illuſion. Some of them, more fertile in Perplexities than clear Principles, are wavering in a conſtant and univerſal Heſitation. They diſcourage us in our Searches after Truth, and we are aſtoniſhed to find ſo much Uncertainty united to ſo much Wit. Their Example ſeduces others, who, deſpairing to attain any ſatisfactory Knowledge, reſign themſelves, in conſequence of that Perſuaſion, to Pleaſure, to Inſignificance, and a Scepticiſm of Mind, which is more remedileſs than Immorality itſelf. Others, on the contrary, flatter us with Promiſes, by much too magnificent: They inſpire us with an immoderate Opinion of the Extent of our Reaſon, and ſubject every thing to their own Examination. They are never perplexed in their Inquiries; and, to hear their Diſcourſe, you would imagine they had penetrated through all the Myſteries of Spirituality and Matter. With a ſingle Turn of Hand, they diſconcert the whole corporeal Syſtem, and range it anew as they think proper. They are the Partiſans of a Syſtem of Imagination that comprehends the Univerſe; they diſcover the full Play of thoſe mighty Springs that give Motion to the World, and know the Fabric of the minuteſt Parts that compoſe it. They ſpeak of every Particular, and give a bold Solution of the Whole.

But, alas! how frequently are we obliged to moderate theſe vain Pretenſions! When we deſign to be natural and undiſguiſed, we are conſtrained to acknowledge, that if Nature be ſo open to our View, as to preſent us with a noble Spectacle, yet the internal Parts of this Appearance are withdrawn from our Obſervation. We are unacquainted with the Movement of the Machines; the particular Structure of every Part, and the Compoſition of the Whole, are Points that ſurpaſs our Underſtanding. We behold the outward Surface, and enjoy it, but the clear and comprehenſive Knowledge of the Depths and Mechaniſm of Nature, is a Favour not accorded to our preſent State.

We reſemble Travellers, who beg in their Journey at the Dawn of a fine Day; a weak, tho' pleaſant Light, begins to colour the Objects around us, and we diſtinguiſh thoſe, eſpecially, that are near us, and do not confound the River with the Banks that border it: This is ſufficient for us, and enables us to continue our Journey. But the Days ſhines not as yet in its full Luſtre.

If we would modeſtly inquire into the Reaſons, why ſuch a ſmall Portion of Light has been imparted to us, we ſhall find it wiſely proportioned to our Neceſſities, and relative to our preſent State; and muſt acknowledge, that had it been more extenſive, we ſhould have been leſs capable of anſwering the End of our Creation. We are only placed here to be virtuous. Our Reaſon is dependent on the Seaſons, by whoſe Miniſtration it receives Intelligence of every thing relating to the Life over which it preſides. This Reaſon is ſubject to a Body, and accompanied with a Set of Limbs: All theſe Organs have been given it, not for Contemplation, but Labour, and the Performance of proper Actions. Theſe are the Purpoſes for which we have received it, and they would have been defeated by ſtronger Illuminations.

A Traveller, in order to proceed regularly in his Way, ſhould be capable of diſtinguiſhing the Objects around him, or elſe he can neither uſe the one, or avoid the other; but there is no Neceſſity for him to be perfectly acquainted, either with the Nature of the Land over which paſſes, or the natural Qualities of the River that flows by him in his Journey; all his Buſineſs is to follow the one, and avoid the other. Were he more penetrating and curious, he would ſtop too long to conſider the Particularities of this River; he would be deſirous of diſcovering its Source and firſt Cauſe; he would ſearch out the leſſer Streams that ſwell it, and be inquiſitive to know the Fiſh it produced, and the Qualities of the Plants that riſe on its Banks; he would be perpetually wandering from Object to Object, and his Journey would never be finiſhed. This is a juſt Image of our Life.

It is true indeed, that the Study and Contemplation of Truth, is neceſſary for us in this State; and it is highly proper there ſhould be Travellers to diſcover the Ways and ſet Marks and Boundaries in Places that are intricate; and likewiſe that their Diſcoveries ſhould guide thoſe who come after them: And theſe are the Benefits we receive from Perſons of great Genius, who are appointed for the Conduct and Inſtruction of others. But Studies which produce nothing, and Speculations intirely barren, and which have no Tendency to improve our Hearts, regulate our Manners, or inrich Society, are Deviations and Amuſements unworthy of our Eſteem, and are ſubſtituted in the Room of neceſſary Labours. The Deity, by contracting our Faculties, has wiſely diſpenſed with our engaging in theſe Diſtractions. Were our Penetration greater, we ſhould be more ſolicitous to ſee than to act; and ſhould certainly diſdain to creep on the Earth, were it poſſible for us to behold or know what paſſes in the Stars.

This Truth will be evidently juſtified, if we enter into a few Particulars. Let us caſt our Eyes on a Husbandman. Such a Perſon conſider'd in a certain Light, and in compariſon with others, ſeems to us an Object of Compaſſion. He is unpolite, lives a laborious Life, and elegant Pleaſures are no part of his Property: He has no Knowledge of amiable Glory, alluring Gold, or glittering Jewels. Has Providence then forgot this Man to laviſh his Favours on others? Nothing can be more deluſive than ſuch a Point of Sight: What Place does this Perſon then fill in the Order of Providence? He is ordained for the moſt neceſſary of all Employments, the Cultivation of the Earth. He is furniſhed therefore with all proper Lights, ſince he has thoſe ſufficient for his Station: Had he more, he would not accompliſh the Purpoſes for which he was appointed: If Pleaſures and Honour were to preſent him with any Attractions, he would think himſelf wretched, in the Obſcurity and Fatigues of his Condition; and it is not for his Advantage alone, that his Underſtanding is groſs, and contracted within a ſcanty Compaſs, but it is much more for the common Good of Society. Were the Peaſant Maſter of Penetration, Delicacy, and Taſte, would he condeſcend to follow a Flock Night and Day? Would he not find himſelf degraded, ed, by the cumberſome and demeaning Cares with which he is obliged to tend theſe contemptible Animals? And yet, were the Earth and Cattle neglected, all Society would be diſconcerted, and intirely deſtitute of Food and Raiment. The Unpoliteneſs therefore of the Peaſant, is a Benefaction to us; and we diſcover our Ingratitude and Injuſtice, when we reproach him for his Stupidity. But our Idea of this Man is applicable to ſeveral others. This Man of Labour and Ruſticity is the whole Species of Mankind; he is our general Repreſentative. We were all placed on the Earth to cultivate and embelliſh it, and render ourſelves uſeful by our Labours. The Diverſity of Employments requires, indeed, ſome Variety in the Talents and Lights; but then theſe Lights and Talents have their Limits, beyond which we are not permitted to paſs; and to be deſirous of proceeding farther is to have an Inclination to move out of our Condition. To what Purpoſe is it to dive to the very Bottom of Beings, to unravel the niceſt Texture of the Organs of a Body; to inquire how the Veſſels that ſupply it with Life, and which are inviſible to our Eyes, can ſubſiſt of themſelves; to divine what are the Elements of theſe Veſſels, and the firſt Principles even of thoſe Elements; in a Word, to launch into Infinity itſelf? We were made for a very different Purpoſe; and to quit the Truths preſented to us, to wander after Informations that elude our Curioſity, in ſhort, to pretend to Wiſdom inſtead of Induſtry, is to forſake the Path of Virtue which is open before us, and to ſtrike out new Tracts wherein we are interrupted at every Step, by inſurmountable Difficulties. 'Tis to reſiſt the Order eſtabliſhed by Wiſdom itſelf, which ſhines bright enough to guide us to our Welfare, but, as yet, has not diſſipated all the Shadows; and when it had even added Revelation to Reaſon, its Intention was to clear up thoſe Doubts we may entertain, with reſpect to the way in which we ought to proceed, and not to lift up the Vail that deprives us of the true Knowledge of Things. That Period is not yet arrived.

The real Advantages of Reaſon.

But if it be very juſt and neceſſary to be ſenſible of the Inſufficiency of Reaſon in certain Points, and to ſubmit, without repining, to the Law of him who has regulated all things according to his own good Pleaſure, it is ſtill equally juſt to know the Value of this Reaſon, and exerciſe it according to its Extent and Ability. Next to Faith, which without Reaſoning informs us of what we are to believe, practiſe, and hope for, we are poſſeſſed of no other Treaſure more precious than Reaſon. If this does not penetrate to the very Depth and Nature of Objects, it is at leaſt ſenſible of their Excellence, and qualifies us to conſider them without Confuſion: It beholds their Exterior, and is conſcious of their Operations and Effects; it diſcerns their Relations and Number; their Agreements, Properties and Uſefulneſs: In a Word, if it be not furniſhed with very clear Ideas, it however has diſtinct Perceptions which it improves to a wonderful Advantage: It enjoys its Privileges, and acts with the Precaution of a Traveller, who, as he paſſes along, takes notice of what is peculiar to every Country, and knows the Roads, the Inconveniences and Accommodations; and without ſtopping at any particular Place, obſerves and makes uſe of the Whole.

To have a fuller Conviction of the Excellence of our Reaſon, and the ſtrict Obligation we are under, of improving it to all poſſible Perfection, we need only compare it with what we have moſt active and accompliſhed on Earth, and conſider the Rank it holds there, and the Functions it performs. When we examine the various Animals with which Nature is univerſally peopled, we diſcover in them all a certain Induſtry and juſt Precaution, in the means they chooſe for nouriſhing and rearing up their Young. They have an Imitation of Reaſon, becauſe all their Actions tend to a particular Point; and we cannot miſtake in them, the Operation of an infinite Wiſdom and Power, which has varied their manner of Life, and imprinted on each Species a Method of proceeding which is never diſconcerted: However, we are not to ſuppoſe them poſſeſſed of Underſtanding, ſince they are intirely deſtitute of Reaſon. That Wiſdom by which they act, and which directs their Motions, reſides elſewhere: If they had it in themſelves, if they thought and reaſoned, we ſhould not ſee them embarraſſed, ſtupid and intractable, when taken out of the way of Life which is peculiar to each Species. If a Spider had all the Skill of a Weaver, ſhe would make ſomething elſe beſide her Web. Were the Swallow as ſkilful as a Maſon, ſhe would build with other Materials than Mortar. Were

Animals once capable of Thought, they would not be limited to one invariable Track, and new Ideas would be infuſed into their Minds. The Principle of Reaſon would not be unfertile in them, but would diſcover itſelf by an Air of Curioſity; by new Efforts, and new Works; and the Variety of their Thoughts would not fail to diverſify their Induſtry. It is quite otherwiſe, with reſpect to the Induſtry of Man; he has not received, like other Animals, an Impreſſion of Hability and Vigour, for producing an uniform Operation, by proportionable Organs. The Reaſon of Man is an active and fruitful Principle, which knows, and would be perpetually inlarging its Attainments; which deliberates, wills, and chooſes with Freedom; which operates, and, if I may uſe the Expreſſion, daily creates new Works. Reaſon has even enabled Men to imitate the Fabrick of the World, in a Sphere that regularly exhibits its Movements and Revolutions, and this Faculty procures to him ſomething ſtill more beneficial and noble: It makes him acquainted with the Beauty of Order, to the end it may be the Subject of his Admiration, and that he may reliſh and obſerve it in all his Performances. He can even imitate the Deity, and his Reaſon renders him the Image of that Deity upon Earth.

It not only makes him acquainted with the Exterior, the Beauty and Value of every Object, but likewiſe gives him the real Enjoyment thereof. It is this Reaſon which conſtitutes him the Maſter and Monarch of all the Earth, and acquires him the Poſſeſſion and Sway of his Empire.

'Tis true, indeed, Man is not invigorated with the Agility of Birds, who are every Moment wafted by their Wings to a large Diſtance. He is not fortified with the Strength of thoſe Animals, who are armed with Horns, ſtrong Talons, and deſtructive Teeth; much leſs is he array'd, like them, by the Hands of Nature; he neither comes into the World with Furs, or Plumes, or Scales, to defend him from the injuries of the Air. Does ſuch a Deſtitution comport with the Lord of the Earth? But he has received the Gift of Reaſon, and is therefore rich and ſtrong, and plentifully accommodated with all he wants. This informs him, that whatever Animals enjoy, 'tis all for his Uſe; that in Reality they are his Slaves; their Lives and Services are at his Diſpoſal. Is he deſirous of Game for his Regale? He diſpatches his Dog or Falcon, who are trained up for that Purpoſe, and, without any Trouble of his own, he is accommodated with all he wants. Would he, in one Seaſon, change the Habit that clothes him in another? The Sheep reſigns to him her Fleece, and the Silk-Worms ſpin, for his Uſe, a more light and gorgeous Robe. The Animals ſuſtain him, and keep Centry at his Door; they combat for him; they cultivate his Lands, and carry his Loads.

Nor do the Animals alone lend him their Agility and Vigour: Reaſon makes the moſt inſenſible Creatures contribute to his Service; it cauſes the Oaks to deſcend from the Mountains, and forces the Stones to ſtart from their Quarries, to furniſh him with an Habitation. Would he change the Climate, croſs the Seas to diſtant Lands, and either carry any of his Superfluities thither, or bring back from thence what he wants? He makes the Mobility of the Waves and Winds ſubſervient to his Deſigns. Reaſon places the Elements and Metals in Subjection to his Neceſſities; and every Object around him is ſubmiſſive to his Laws.

As inconſiderable as he is in Bulk, his Reaſon furniſhes him with a Power, which is only bounded by the Earth he inhabits; his Deſires are accompliſhed at each Extremity of the Globe; and, if I may uſe the Expreſſion, he brings theſe together when he pleaſes, and eſtabliſhes an Intercourſe between them, without ſtirring from his own Habitation. He paints his very Thoughts in Writing, and his Letters, without any Trouble to him, are circulated through Nations and intimate his Will to a People three thouſand Leagues diſtant from him. He correſponds with the whole Earth, and after his Death, is even capable of entertaining the lateſt Poſterity. It is impoſſible to purſue Reaſon through all her Wonders; ſhe inriches and adorns every State, and I think her as admirable in the Fingers of Artiſts, where ſhe proves a Source of Beauties and Accommodations, as ſhe is in the Diſcourſe and Writings of the Learned, where ſhe appears an inexhauſtible Treaſure, as well of Inſtructions and Relief, as of Conſolation and Pleaſure.

To ſuch valuable Productions and precious Advantages Reaſon joins a Sett of Privileges that ſtill ennoble her the more. She is the Centre of the Works of God on Eaath; ſhe is their End, and conſtitutes their Harmony. Let us take Reaſon but a Moment from the World, and ſuppoſe Mankind deſtitute of her Influence; all Union would ceaſe to ſubſiſt among the Works of the Deity, and a general Confuſion be introduced through the Whole. The Sun enlightens the Earth; but this Earth is inſenſible, and wants none of that Luſtre. The Rains and Dews, aided by the Warmth of that amiable Orb, give Vegetation to the Seed, and cover the Fields with Harveſts and Fruits; but theſe are all loſt Riches, and there are none to gather or conſume them. The Earth, I confeſs, will nouriſh the Animals; but theſe Animals are inſignificant, for want of a Maſter to exerciſe their good Qualities, and concentre their Services. The Horſe and Ox have Strength ſufficient to enable them to draw or carry very weighty Loads; their Feet are armed with Horn, capable of reſiſting the moſt rugged Ways; but they neither needed ſo much Force nor ſo ſtrong a Horn, to qualify them for grazing in the Meadows where they ſeek their Paſture. The Sheep is charged with the Weight and Impurities of her Fleece, and the Cow and Goat are incommoded with the Redundancy of their Milk. Diſadvantage or Contradiction reigns through the Whole. The Earth incloſes in her Boſom Stones fit for Building, and Metals proper for the Formation of all Sorts of Veſſels. But ſhe has no Gueſt to lodge, nor any Workmen to employ theſe Materials. Her Surface is a ſpacious Garden, but not beheld by any Spectator; all Nature is a charming Proſpect, but afforded to none. Let us reſtore Man, and replace Reaſon on the Earth; Intelligence, Relations and Unity will immediately reign through every Part, and the very Things which did not ſeem created for Man, but more immediately for Plants or Animals, will have ſome Relation to him by the Services he receives from thoſe Animals and Plants. The Gnat depoſites her Eggs in the Water, and they produce a Species of Vermin that live a conſiderable Time before they inhabit the Air, and are the uſual Suſtenance of Fiſh and Water-fowl. All theſe are made for Man; 'tis therefore to his Advantage that Gnats ſhould exiſt. In the ſame Manner he approaches all other Beings. His Preſence is the Band that connects ſuch a Variety of Parts into the Whole; and He is the Soul by which they are animated.

In a Word, Reaſon not only renders Man the Centre of the Creatures who ſurround him, but likewiſe conſtitutes him their Prieſt: He is the Miniſter and Interpreter of their Gratitude; and it is by his Mouth that they offer their Tribute of Praiſe to him who has formed them for his Glory. The Diamond is neither acquainted with its own Value, nor knows from whom it received its trembling Luſtre. Animals are ignorant of him who clothes and ſuſtains him. The Sun himſelf is inſenſible of his Author. Reaſon alone diſcovers him; and as ſhe is placed between the Deity and Creatures of no Underſtanding, ſhe is conſcious that in uſing theſe Creatures, Gratitude to God, Adoration and Love are incumbent on her. Without her Preſence all Nature would be mute; but by her Mediation, every Part of it proclaims the Glory of that Being from whom they received their Exiſtance and amiable Qualities. Reaſon alone is ſenſible ſhe is in his Preſence; ſhe alone knows what ſhe receives from his Bounty, and enjoys the ineſtimable Happineſs of being able to adore him, for all that is either in or around her; and as there is Reaſon upon Earth, conſequently there ought to be Religion, and Man ſhould be devout in Proportion to his Rationality. It is apparent that his Religion is only weak, according as his Reaſon is ſunk and perverted; which always happens when he obſtinately deſires Attainments that ſurpaſs him, or neglects to inrich himſelf with what was intended for his Inſtruction and Exerciſe.

This, my dear *Chevalier*, is a ſlight Sketch of the Advantages and Prerogatives of Reaſon; and they are doubtleſs ſo conſiderable, that Man, far from having any Cauſe to complain of his Condition, ought to be ſurpriſed at the prodigious Variety of Informations and Productions he is capable of accompliſhing. And the more ſenſible he is of the Dignity and Excellence of Reaſon, the more he perceives the Neceſſity of cultivating and improving it: But the capital Point, wherein this Cultivation conſiſts, is to be conſtantly exerciſing our Faculties on Objects ſuited to their Power, and which make us better and more happy.

Let us judge of our proper Behaviour on a thouſand Occaſions, by that which we ought to obſerve in a ſingle Inſtance. Nothing is more lovely than the Light, nothing more worthy to exerciſe our Underſtanding than that Object which gives Beauty to all Nature. Let us inform ourſelves at leaſt then, of one Part of what may be known of it, and eſpecially of what may be known to Advantage. But to make the Thing more intelligible, we ſhall uſe a very familiar Image.

I find myſelf in a Stage-Coach with two Philoſophers, whoſe Sentiments are almoſt diametrically oppoſite. We will ſuppoſe our Journey began long before Day, and that all the intervening Time was paſſed in Sleep or Diſſatiſfaction; but at laſt the Dawn appears, and we are all awake: Some Reflections on the ineſtimable Benefit of Light and Colours create a Diſpute between my two Philoſophers, and give them an Opportunity of reaſoning on the Nature of Light: One pretends, not only to explain what it is in itſelf, but likewiſe our own particular Idea of it. His Adverſary finds both the one and the other unintelligible, and concludes with obſerving, that Man in his whole Extent is not above ſix Feet high, and yet fancies he has a real Idea of an Altitude of ninety or a hundred Feet; of the Extent of a Plain, or the Diſtance of the Stars from our Earth. From whence he obſerves, that it being a manifeſt Abſurdity to affirm one can have in himſelf, the real Idea and Meaſure of an Object by which he is exceeded in Dimenſions, it muſt conſequently be impoſſible to ſee, and that there is no Reality in Viſion; that every Thing is abſurd and uncertain, and that he himſelf is not even ſure, whether he is in our Company or not, in the Coach. I liſten to them both, and when the Warmth of the Argument is a little abated, they appeal to my Deciſion. Gentlemen, ſay I, permit me to acquaint you with my Sentiments without Reſerve. The Diſcourſe began with enumerating the Advantages and Uſe of Light and Colours; and you turn your Eyes from a plain Queſtion, whoſe Solution is very obvious, to caſt them on two Labyrinths of Difficulties immaterial to the preſent Affair.

One of you, being accuſtomed to heſitate on no Point, pretends to explain the Nature of Light, and the Idea we entertain of it; the other habituated to doubt of every Thing, is not even certain he ſees the Day. One would know what in all Probability is concealed from us; the other would be ignorant of what we really perceive. Let us obſerve a Medium, and endeavour to know and improve what we have in our Power, inſtead of purſuing what is forbidden, or ſuffering what we poſſeſs to remain uſeleſs. What would you think Gentlemen, of two young Apprentices to a Clock-maker, who having received from their Maſter Braſs and Tools to make a Wheel, ſhould ſpend the Day in diſputing on the Nature of the Metal put into their Hands? Light and Colours which are the Subject of your Diſpute, were intended to conduct us, and not be the Matter of our Diſquiſitions and ſpeculative Diſagreements. We would willingly penetrate into all its Properties, becauſe we find ourſelves curious; or elſe deny its Exiſtence, becauſe the Nature of it appears incomprehenſible. Theſe are two Extremes equally diſcommendable. Let us therefore enjoy Light and Colours, without making too deep Reſearches after what they are in themſelves; or if we have an Inclination to reaſon on that Subject, let it be proportioned to our Capacity, and always with a View of ſome new Advantage; and ſo without knowing the Nature either of Light, or the Glaſs through which its Rays are tranſmitted, we may make the Glaſs, and modify the Paſſage of the Light in ſuch a Manner as to aſſiſt the weakeſt Eyes, cauſe the moſt diſtant Objects to approach us, and magnify thoſe whoſe Minuteneſs makes them ſhrink from our View.

This is a laudable Manner of exerciſing our Underſtanding and Hands with regard to Light: Or, if we will confine our Minds to Speculations and Reaſonings, let us chooſe ſuch as may inrich that Faculty with ſome undeniable Truths, capable of improving us by affording better Informations, and making us more affected with what we have received.

For Example, if we only conſider the Uſe of this Light, which was the Point in Debate between you, is there not a viſible Deſign in it, a charming Grandeur and Beneficialneſs? A Moment ago, all Nature was plunged in Darkneſs, and every Object was dead to us, becauſe the Gloom deprived us of their Uſe: But the Re-appearance of Light in ſome Meaſure raiſes Nature from Annihilation, and reſtores its Benefits to Mankind.

But this alone is not ſufficient to make Objects diſtinguiſhable; were they all of the ſame Complexion they would be confounded by the Eye; but you ſee they are clothed with a Livery or rather bear a Ticket, that renders them diſtinct; and by their Surfaces eaſy to be diſtinguiſhed and perceived, which ſaves Mankind the Labour of long Searches, and the Uncertainty of thoſe Reaſonings he would otherwiſe make on their various Natures, that he might not confound them: With Reſpect to the Variety of Colours, ſome are ſoft and friendly to the Eye, particularly green; others melancholy and languiſhing, as brown and black; ſome lively and dazzling, as white and red: And if large Quantities of theſe two laſt Colours had been ſhed over the Surface of the Earth, our Sight would have been fatigued. Did Black frequently make its Appearance in Nature, it would have arrayed her in Mourning; but let Green be generally unfolded, the Eye will be aided and refreſhed, without our knowing the Reaſon; and therefore we ſee that the ſame Creator who formed the Eye, has diffuſed over Hills and Plains, and all Nature around us, that ſoft and ſmiling Verdure, which is ſo accommodated and convenient to the Sight, and yet, that he might not by too univerſal a Green defeat the general Intention of diſtinguiſhing Objects, I obſerve that the Verdure of a Meadow differs from that of ſowed Land; that every Tree and Plant has its peculiar Tinge, and the Shadings of the ſame Colour diverſify in ſuch a Manner the Habit given to each Body, that they are all known and eaſily diſtinguiſhed.

Theſe are the firſt Thoughts that occur to me on the Subject of Light, and by which I endeavour to reclaim my Travellers from Preſumption and Uncertainty, to plain and palpable Truths; and ſuch are thoſe which are preſented to us in all we ſee, provided we conſtantly confine ourſelves to what is ſimple, beneficial, and neceſſary; equally avoiding the Extremes of perpetually creeping, when we have Wings to raiſe us, and immoderately ſoaring, when we are once aloft.

All that has been ſaid may be reduced to a Maxim, eaſily retained and practiſed. With Reſpect to all created Things that riſe to our View, there are but three Particulars wherein we can fix a Determination: One muſt be, a Reſolution to know nothing; the ſecond, a Deſire to comprehend the Whole; and the third, an Inclination to ſearch after and improve to the beſt Advantage whatever we are capable of knowing. The firſt Determination is a Piece of Indolence that runs into mere Stupidity; the ſecond is a Temerity which is conſtantly puniſhed, and the third is a Reſolutiun of Prudence, which, without aſpiring to what ſurpaſſes the Capacity of Man, is exerciſed with Modeſty, and gratefully uſes what was made for our Enjoyment.

I am, &c.

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